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(Continued on page cxiii)



# DISCOVERY

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## Notes of the Month

A PRESENT-DAY problem of the greatest importance—the most beneficial use of leisure—was the subject of a well-attended conference at the Queen Mary Hall, London, W.C., on November 18th. The conference was organised jointly by the British Institute of Adult Education and the National Institute of Industrial Psychology, and Sir Wyndham Deedes took the chair. The proposal to be considered was an investigation of the opportunities for leisure, and the use made of them by workers and their families in districts selected as characteristic of existing conditions. The Chairman, in introducing the scheme, laid stress on the fact that nothing inquisitorial was envisaged, and no invasion of the privacy of the Englishman's home would be attempted. But his experience revealed that of some 700,000 members of boys' clubs, 72 per cent. received no adequate physical training or recreation. Some co-ordinating effort was evidently to be desired.

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The first step was the acquisition of information, and Capt. J. H. Blaksley, the originator of the scheme, emphasised the necessity of this preliminary; this was, in fact, to be the main object of the proposed committee of investigation. The enormous scientific resources at the disposal of the 20th century should be called in to adjust the balance of human values, correcting the

distortion caused by the one-sidedness of 19th-century development. The exquisite balance of Greek civilisation was made possible by the existence of a slave class; to-day, the machine was there to take the place of the slaves, and it was the duty of all to see that it did not become master. In his draft report he pointed out that many factors of our time tended to increase the amount and importance of leisure, but yet for many the opportunities of leisure were restricted. Six or eight months of investigation should enable the committee to produce a report, from which action could be taken. An animated discussion followed, in which the representatives of many and varied organisations took part. Reports of progress will gladly be submitted to all those who apply to the National Institute of Industrial Psychology.

\* \* \* \*

British scientists figure prominently in the list of Nobel prizewinners published last month. Professor G. P. Thomson, who occupies the Chair of Physics at the Imperial College of Science, shares the Physics Prize with Professor C. J. Davisson of New York, for the experimental discovery of interference phenomena in the irradiation of crystals by electrons. Professor W. N. Haworth, of Birmingham, for his research work on carbohydrates and vitamin C, shares the Chemistry Prize with Professor P. Karrer, of Zurich.

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On November 19th a special exhibition, to be open till the end of February, was inaugurated at the Science Museum, South Kensington. The subject—Atom Tracks—is one of profound interest to all who have been following recent developments in physics, while, from the point of view of the general public, the exhibits will clear up many puzzling mysteries. The centre-piece of the exhibition is C. T. R. Wilson's original expansion-chamber apparatus of 1911-12, for making visible the tracks of individual atoms and electrons (lent by the Cavendish Laboratory, Cambridge). The remainder of the exhibition consists of a collection of over 80

photographs which have been taken by research workers all over the world using Wilson expansion chambers. By Wilson's method the actual paths pursued by flying atomic nuclei and electrons can be seen and photographed, their collisions one with another can be studied and even the transmutation of one element into another can be observed. An introductory group of twelve photographs illustrates simply some of the main properties of alpha-rays, beta-rays, X-rays and cosmic rays, while the main collection is arranged in a series of groups showing typical effects produced by alpha-, beta- and gamma-rays, X-rays, protons, deuterons, neutrons and cosmic rays. Many of the exhibits have been furnished with key diagrams, so that their essential features can be readily picked out even by the visitor who is relatively unfamiliar with the subject, and some of the photographs can be viewed stereoscopically in pairs. A small handbook, with detailed descriptions, has been prepared by Dr. F. A. B. Ward, who has arranged the exhibition. It is on sale at the Museum and can be obtained from the publishers, H.M. Stationery Office (6d., by post 7d.).

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The alarming outbreak of foot-and-mouth disease in the Eastern Counties has deservedly received much attention; and in view of the urgency of the question, the letter written by Mr. Hugh Pollard (a former editor of DISCOVERY) to *The Times* deserves special attention. Mr. Pollard suggests a connection between the incidence of the disease and conditions favourable to fungi. This year has been a specially good one for fungi of all sorts; and now, as apparently in other similar years, foot-and-mouth disease is rampant. At the very least it can safely be said that Mr. Pollard's appeal for research along the lines indicated is a cogent one. It may further be noted that a virulent form of the disease has broken out in Belgium, where climatic conditions are likely to be similar to those in eastern England, and, if Mr. Pollard's theory is sound, the infective cause may well be the same.

\* \* \* \*

Mr. Stanley Morison, who lectured before the British Academy at Burlington House recently on, "The Art of Printing," showed that the book-printer has always borrowed from the news-printer. Even the best collec-

tions of examples of printing art of past centuries contained only a few specimens of ephemeral print, such as the news-sheet; all advances in technique, such as the steam press and the linotype, had been developed by the news-printer and later used by the book-printer. He thought that the reluctance to regard news-print as art was due to its lack of exclusiveness; it was distributed too widely. He instanced the Duke of Urbino, who, in the fifteenth century, refused to allow even a printed book in his library; it was confined exclusively to masterpieces of calligraphic art, of which it would be certain only one example existed. Mr. Morison had many interesting things to say about the development of the type face, and sought to prove that the calligrapher borrowed from the printer as often as the latter borrowed from the former. It was true, however, that early text printing used almost entirely the letter-form of the calligrapher, and even now many new type faces were based upon centuries-old designs which were simply developments of calligraphic letter form.

\* \* \* \*

The inquiring public has recently suffered a great disappointment: it appeared that the Himlayan mystery of the "Abominable Snowmen" was at last satisfactorily solved by Mr. Frank Smythe's observations, reported in *The Times*, and that the tracks which have terrified porters and mystified explorers for so long had at last been fastened on to our old friend *Ursus arctos* (whether *pruinus* or *isabellinus* is for the moment beside the point). But it was not to be. Mr. Smythe's remarks aroused an immediate blizzard

of objections in the correspondence columns of our great contemporary; the partisans of the genuine original Snowman flocked to the defence, and Mr. Smythe's bear-tracks are shown in scornful comparison beside those of a "perambulating soup plate." Can it be that this is part of a dark conspiracy on the part of the more esoteric members of the Himalayan Club to preserve a cherished mystery of their mountains? If so, Wing Commander Beauman's excellent suggestion of a joint zoological, geographical, and mountaineering expedition can hardly come to fruition; and this would

be a pity, as now that the pundits have had their fun, it is time that they got down to some genuine research.

#### BYWAYS OF NATURAL HISTORY

Our issue this month opens with a series of articles dealing with some little-known aspects of the world of natural history. Mr. Edward Samuel, the well-known Australian naturalist, deals with the fascinating little "flying squirrels" of his native continent. The *Bêche-de-Mer* sea-slug is a curiosity of the neighbouring seas, while the horror of the Black Widow Spider, encouraged by the recent droughts, haunts the other side of the Pacific. Asia is represented by the voracious Assassin Bugs, vividly described by Dr. Malcolm Burr; while Capt. Hitchens touches the borderland between natural history and legend in his eerie suggestions of the unknown terrors lurking in the jungles of Africa.

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## Australia's Gliding 'Possums

By Edward Samuel

POPULARLY known to bushmen as flying squirrels, and to science as flying phalangers, the volplaining pouched animals of Eastern Australia are both shy and secretive in their ways. By day the sun shines down on their bushland haunts of timbered ranges and valleys, through the myriad trunks and foliage of towering eucalyptus, where, but for bird and insect wings and voices, life is singularly still. It is at night, when the thump, thump, of wallabies is heard in the gullies, that shrill calls echo through the trees, and the blurred image of agile bodies shooting swiftly through space proclaims the awakening of these beautiful furry gliders. Few Australians, and fewer people elsewhere in the world, realise the variety of intensely interesting members of this silky-furred family—ranging from mouse-size to that of a small but impossibly long-tailed cat. Their tenancy of the tree-tops, coupled with the exclusive method of swift nocturnal travel, renders them elusive to those who seek to study them, though they occur even within twenty miles of Melbourne.

It is often asked how they fly. They do not fly at all. They are members of the opossum family and are not related to the flying fox family, where true powers of flight are developed. These gliders differ only from their more sedate 'possum relatives in that they possess a loose flap of skin connecting fore and hind legs with the flanks of the body, while the prehensile clinging tail of the non-gliding ancestral animals has changed into a furry plume acting as a rudder and balancing organ. When the limbs are outspread, the membrane is stretched taut and the animals swoop down and away, to glide gently upwards, alighting gracefully and clinging easily, with their delicate fine claws, on a lower trunk, in some cases over 100 yards away from the loftier starting point. From their relationships and the true mode of travel, it is understandable that nowadays the accepted familiar name is, as it should be, gliding 'possum or 'possum-glider. There are five Australian gliding 'possums, with some variety of the recognised species, and Melbourne Zoo is proud of the only complete representation of these highly interesting animals. Many visitors, conducted round the big flight enclosure at night, have been treated to fascinating displays by these gliders, which hide away by day and come forth to gambol and shriek in the moonlight.

The largest of our gliding marsupials is an extraordinary and arresting sight to anyone gaining a first impression. One might almost term the Greater Gliding 'Possum the "frying-pan" animal, so strongly does it resemble that homely utensil during its aerial swoops. With its soft, silky fur, usually of a dusky black colour, its quaint 'possum face so reminiscent of the ringtails, and its very long pendulous tail, forming two-

thirds of its total length of 40 inches, it is decidedly different from any other native animal. Actually the long-legged creatures, so awkward and clumsy away from their arboreal environment, are little more than thin bony frames covered with loose skin. The colour is subject to a good deal of variation and, though normally rusty-black with white underparts, it is common



Top: One of the largest gliders, the Flying Phalanger, showing the long tail.



Above: Feeding a "Pigmy 'Possum" with honey.



Left: A white-headed Flying Phalanger caught at Warburton, Victoria.

to find Greater Gliders wholly white or partially so. One of the strangest sights was a white-headed specimen captured recently in the timber near Warburton, Victoria.

In the bush the home tree of the big gliding 'possum is usually betrayed by the scoring of the bark where the sharp claws have repeatedly torn the surface in "landing" and one may usually determine whether the inhabitants are at home or not by striking resounding blows with an axe on the butt of the tree-trunk. Possibly a shaggy-eared head or even two may soon gaze forth with that characteristic sombre, wistful expression from a lofty hollow. Finding the unpleasant jarring vibration nerve-racking, the animals usually proceed to climb upwards with a queer and typical galloping motion, finally perching as high as possible, with long tails swaying in the wind. As a rule further blows on the tree-trunk at this point cause the animals to stiffen their bodies with heads projecting forward and then to leap forth, as the adjoining photograph shows, to glide down some well-known aerial track to a broad trunk, sixty or even eighty yards away. Here the curious, deliberate galloping climb into the higher regions is repeated. However, it is by its startling call that this largest of volplaning marsupials is best known. In the starlit gullies among the big timber, the loud, gurgling shriek rises sharply up the scale, followed by a series of bubbling sounds, and the cries are uttered while the animals are actively moving about and indulging in their gliding swoops. Anyone who has been out in the big timber of the gullies on a moonlight night will ever afterwards associate the mysterious stillness and the towering trunks with the shrill piercing screams of the "flying squirrels."

Among native mammals the large gliding 'possums have the distinction of vocal efforts second only in volume to the scream of the Tasmanian Devil. Strange to say, the Greater Gliding 'Possum is totally different in its feeding habits from the other gliders. Its strict vegetarian diet is quite in conformity with its apparent evolution from the ringtailed 'possums—also leaf-eaters—whereas the smaller gliding 'possums (except the pigmy species), whose ancestry is probably derived from the same stock as the extinct Leadbeater's 'Possum, feed on insects, nectar, fruit and sap. In Victoria the Greater Gliding 'Possum's favourite diet consists of the finer branch-tips of the peppermint eucalyptus, but it

feeds also on several other eucalypts, particularly manna-gum and long-leafed box. Down in the gullies on still nights, the whereabouts of the feeding animals are difficult to locate, but eventually the faint sound of a leaf being pulled betrays the position. A powerful torch beam picks out the yellow orbs of the long-tailed animal, which regards the bright light with a faint show of curiosity. But it is scarcely sufficient to interrupt the meal, and soon the phalanger puts forward a long forearm and pulls more leaves within reach. Unfortunately the destructive fox kills many gliding 'possums, which he catches low down on the tree trunks, or even on the ground. However, the Greater Glider, its stomach crammed with highly odorous masticated peppermint leaves, baffles the raider, and is left strictly alone.

The single "joey" of the species is usually born in July or August, and at first it is no larger than the head of a drawing pin and just as pink as any 'possum of similar age. It is fantastic to imagine that such a mite could ever indulge in graceful aerial flights. However, it develops slowly but steadily, and, four months later, having grown a short coat of black fur, a very spindly little creature is forced to leave the pouch, having attained too large a size to fit into its "pocket nursery." Until it grows larger and more sturdy, the joey is either left at home in the hollow or carried on the mother's back during her nocturnal wanderings.

Slightly smaller than the Greater Gliding 'Possum, but exquisitely beautiful, the Yellow-bellied species ranges from Northern Queensland to Southern Victoria, though it does not appear to be particularly numerous anywhere. The thick silky greyish-brown fur is very long and beautiful in those animals inhabiting the high mountainous country of Eastern Victoria, and, when rolled up in the daytime, each animal is almost hidden in the huge bushy coil of its own tail. When seized, the animals utter ear-splitting shrieks of protest, somewhat like sharp blasts on a whistle. They have cupboard-shaped compact nests in the hollows of trees, composed of tightly packed gum leaves.

In descending order of size, two very dainty and pretty species of gliding 'possum, practically identical in colour, follow the yellow-bellied species. The first is known as the Squirrel Gliding 'Possum, and is distinguished from the smaller species by being twice its size, having a longer face, and a far more bushy tail. In fact the lovely, fluffy tail, with fur over an inch and half long



*A Gliding 'Possum in the air.*

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near the base, is quite squirrel-like in all but the position in which it is carried.

With the Short-headed Gliding 'Possum, Sugar Glider, or "Sugar Squirrel," we come to the best known, the hardest, and one of the prettiest gliding marsupials. It is easily bred in captivity and makes a most delightful pet; but one has to experience the painful bites of its sharp incisor teeth and hear the droning "self-starter" screams to appreciate the spitfire temper of these dainty but forceful creatures. Only fifteen inches in total length, with a lovely ash-grey coat and less bushy tail than its larger relatives, the Sugar Glider is usually a gregarious creature, and it is common to find a number of them rolled up together in a hollow limb and ensconced in a comfortable leaf nest. The small entrance hole occasionally betrays the secret of the tree's occupants when silky grey hairs are detected clinging to its edges. The little gliders have a most interesting method of furnishing their homes. They are observed at times hanging upside down among the leaves of a eucalyptus, nipping off sprays here and there. These are then transferred by means of the fore feet to the hind feet, and then to the furry tail, which immediately curls round the bundle. Thus burdened, the bright-eyed little animals run along the boughs to the nest, and, having disposed of the leaves, soon appear to gather more.

#### Musky Scent

A distinctive and rather musky scent permeates all nesting sites, and it is frequently unbearably strong. Like the larger and closely-related Yellow-bellied and Squirrel species, the alert Sugar Gliders are not leaf-eaters; but, with their long incisor teeth, they find no difficulty in chewing into the tender wood of young branches, seeking the sap. The blossom of flowering trees is sought over long distances, an easy accomplishment with their swift means of travel, and insect food is an essential part of their natural diet. One may derive great entertainment from watching a Sugar Gliding 'Possum sitting up daintily like a true squirrel and eating a moth with every evidence of enjoyment. Only the wings are discarded.

Although it does not utter a nocturnal shriek, the Sugar Squirrel is quite versatile in the matter of vocal accomplishment. Its quarrelling notes are the droning complaints so well known to those who have handled the animal, but most typical is a shrill, yapping grunt uttered as a rule on still nights. Reminiscent of the shrill bark of a toy terrier, this queer grunting yap invariably greets the glare of a camp-fire in the timber, and is probably a cry of both alarm and curiosity. The baby animals utter hissing cries, especially when separated from the mother. It is particularly inter-

esting to know that the male Sugar Glider is almost unique among pouched animals in that he has sense of paternal responsibility. When the "joeys" have become too large for the pouch but are yet too small to be left entirely alone, he carefully "mothers" the usual twins in the nest while his mate seeks her evening meal.

#### A Charming Pigmy

Last on the list, and most certainly least in size though not in interest, is that tiny sprite of the gum-tree—the "Feather-tailed Mouse" of the bushman and the Pigmy Gliding 'Possum of the naturalist. It is doubtful whether any creature wearing fur, feathers, or scales is more aptly fitted with generic and specific names than the Pigmy Glider or *Acrobates pygmaeus*. Pigmy acrobat it most certainly is—a tiny grey-brown creature only five inches in total length, which flits noiselessly in short gliding leaps from branch to branch. The tail has a lateral row of hairs on either side, giving it a striking resemblance to a feather. A clarifying allusion to this is contained in the otherwise mixed and amusing note from a quaint old bushman to me in which it said: "Dear Sir,—I have caught some funny little 'insects' with tails like feathers. Come and get them quickly."

Though quite common in the Eastern States, it is owing to their small size and nocturnal habits that "pigmys" are so rarely observed. They are occasionally brought in by cats or discovered during the felling of timber. The tiny gliders construct a neat nest of dried gum leaves, about the size and shape of a cricket ball, in a hollow limb, and they usually live in family groups. In one instance a bushman left an old coat hanging to a nail on the side of a tree near his hut. On its removal two months later four "pigmys" made a hurried exit, and their leaf nest fell from the rotting lining. Being of an extremely delicate and timid disposition, Pigmy Gliders are difficult to keep under captive conditions. Natural hollow tree limbs furnished with with dry leaves are necessary as daylight retreats, and a constant supply of insects is essential. Additional acceptable food consists of sugar, bread and milk flavoured with honey or melon jam, and sprays of blossoming eucalypt, from which the nectar is licked. The amount consumed is negligible, which is not surprising, considering the size of the animal.

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An interesting experiment recently carried out at the Buitenzorg Botanic Garden, Java, concerned the effect of the visits of the local nectar-drinking birds (sun-birds and white-eyes) on plants introduced from America which are normally pollinated by humming-birds. The Asiatic birds extract the nectar when actually clinging to the plants, not hovering like humming-birds; pollination is not effected and sometimes the calyx or corolla tube is punctured.



## The Bêche-de-Mer for the Table

By Ewen K. Patterson.

AMONGST the queerest of sea-denizens are those sausage-like creatures which scientifically are referred to as *Holothuroidea*. Called trepang by Eastern peoples, and bêche-de-mer or sea-cucumbers in European parlance, these creatures are world-wide in distribution, living in all zones and depths. About seven hundred species are known throughout the world, but it is in the shallows of the tropic seas that they excel so far as size and numbers are concerned. The warm coral seas around the tropical northern coast of Australia in particular are noted for bêche-de-mer; probably nowhere else in the world are they as plentiful; and these seas are one of the few parts of the world where bêche-de-mer fishing is a thriving industry.

There are thirty-three species of bêche-de-mer present in these seas, some of them attaining a length of 3 ft. and more, with a girth of five or six inches. They are of all colours, black, brown, dark-green, red, and purple, and they all conform to the conventional cucumber or sausage in the shape of the body. The body wall is leathery in texture and in some species is extremely thick. The bêche-de-mer are by no means nice to look at. In fact, no more unattractive creatures could be imagined, resembling nothing so much as overgrown slugs that haunt the dreams of suburban gardeners! Yet for centuries these creatures, in a sun-dried and smoked state, have been regarded as a great delicacy in China, where elderly Chinese gentlemen have the strange belief that by consuming soup made from the bêche-de-mer it is possible to recapture lost attributes of youth. Accordingly, they pay substantial prices for the article, and as much as £350 per ton has been received for big bêche-de-mer caught in Australia's tropic seas.

The creatures are found on the white sandy floor of coral pools or in the shallow water alongside the coral reefs, where they seem to spend the whole of their existence seeking food. They eat anything of suitable size, dead or alive, that they come across. The mouth is situated at one

end of the body and is surrounded by dozens of small tentacles; and when seeking food the bêche-de-mer simply spreads these and mops up and swallows a mass of sand and rubbish on the chance that this may contain a titbit or two, all waste matter being at once passed out through the body. Although very slow-moving, the bêche-de-mer have remarkable tube feet. These are simple tubes of a thin elastic material which can be protruded through holes in the skin and into which water is forced by means of a series of canals. These canals are situated in various parts of the body; they draw in water from the sea through portions of the skin modified to act as filters and force it into the tubes, which are consequently expanded, and this enables them to act as locomotive appendages. At the end of each tube a little sucking-disc takes a hold on the surface travelled, and it is astonishing how difficult a bêche-de-mer is to remove from the sea-floor once it gets a good grip with these discs.

When in danger from an enemy, some of the bêche-de-mer eject a portion of their internal organs, and thereby save their lives. Noteworthy in this respect is the large purplish-black bêche-de-mer, known as the "cotton-fish" (*Holothuria impatiens*). When molested this bêche-de-mer ejects a mass of whitish material like tangled threads of cotton. This mass is really an assemblage of tubes from its internal organs. The tubes are extremely sticky, and they swell out into a tangled, floating skein upon contact with the sea-water; and the bêche-de-mer's attacker (fish, crab, or lobster) becomes enmeshed within the threads, and is rendered helpless for a time. Meanwhile, the "cotton-fish" makes good its escape and goes into hiding to re-grow the whole of its internals in proper functioning order. Sometimes the "cotton-fish" ejects the "threads" through its mouth (as shown in the accompanying under-water photograph), but often the tubes are shot out through a break in the body-wall. Just as strange



A "cotton-fish" bêche-de-mer, photographed under water, in the act of ejecting some of its internal organs to ensnare an attacker.

is the partnership that exists between some of the bêche-de-mer and a family of little fishes called *Fierasfer*. Often, after watching a bêche-de-mer for a while, you will see several little fishes crawl out from the hind end of the creature's body. The fishes are tiny things (continued on p. 373)

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## The Black Widow Spider

By Weldon D. Woodson

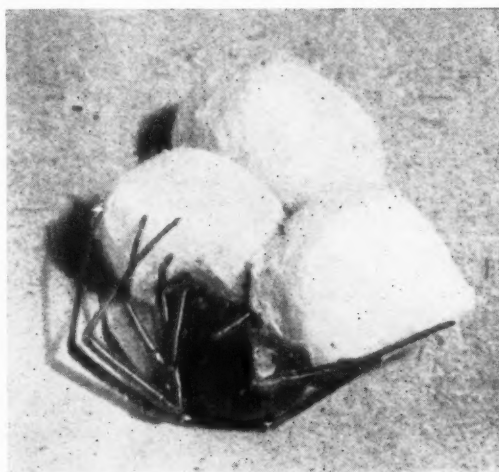
THROUGHOUT the length and breadth of the United States, from Maine to California, a scourge of serious dimensions has swept the countryside since the drought of 1934: an ebony spider, the Black Widow, belonging to the genus *Latrodectus*, which includes the world's only deadly children of Arachne. An authority of Los Angeles, Dr. Emil Bogen, declared, in 1926, that since the early days of the Republic, physicians' records reveal merely 150 patients. And then, in 1932, an investigation showed 380 cases, the majority emanating from the south-west; and since the drought this number has multiplied rapidly. To combat the effects of black widow spider venom, a person depends on treatment still in the experimental stage. Medical accounts describe 75 remedies, all tentative. The virus appears to be neurotoxic, and immediately distributes itself throughout the blood vessels, causing intense pain, impaired respiration, and even paralysis.

The female *Latrodectus mactans*, after mating, takes stock of her larder and, if victuals are scanty, pounces upon the ecstatic but fearful lover, allowing full rein to the poisonous sacs, and shortly after eats him up. Few people would recognise the male *Latrodectus mactans*. As is usual among spiders it is much smaller than the female, never attaining to more than one-third of her dimensions, and resembling the half-grown females of his tribe. He has, however, the advantage of indeterminate colouring, in contrast to the female, which is always black and thus readily picked out. His markings may be brown and white lateral stripes across the length of the body, yellow with polka-dot effect, or clear-cut, rounded white stripes outlined by borders of striking crimson. The hour-glass, while miniature in size compared to that of the Black Widow, is generally more perfect in detail.

The female bulges enormously when pregnant, carrying many hundreds of creamy white or pale grey oval eggs, each approximately 1 mm. in diameter. She softly drops down from her hiding place to the ground during this period, and begins to weave a remarkably beautiful, oblong silken mat. She first spins the fabric

in one full thickness, and then places several additional layers on to the original pattern. After the completion of the work, which, by the way, is often accomplished within the space of an hour, the spider deposits the eggs. Finally, using the scopulae of her feet as hooks, she pulls up the four corners and fastens them together, thus making a globular-shaped cocoon. The period of incubation ranges from two to six weeks.

The infant spider must surmount many difficulties before going free upon its own, including from four to six moults covering a period of two or three months. Its complete life-span is one year, but, when hatched early in the spring, it may, with abundant food supply, mature by the middle of summer, live through the autumn and winter, lay eggs the following spring, and die during the late autumn. But there are many perils of babyhood. The mother's most prominent trait is cannibalism. She sticks out one long, sinister jointed leg into the midst of the conglomeration of newly-hatched young, and strokes her new-born babies; but the movement is only for



A Black Widow Spider with egg sacs.

the purpose of fastening the creature to the sticky scopula, and soon a little milk-white form vanishes back into the body from which it came. The spider's appetite is but whetted by the minute morsel, and both forelegs begin to work. Not until two or three score of the babies have served as food does she desist.

The life and battles of the Black Widow, while interesting to the nature student, are of little interest to the health officials, their desire being to discover an agent that will wipe out the species. There is a variety of sprays and powders which, if thrown upon the mature female marauder, instantly kill her. These include kerosene, creosote and rotenone solutions, crude oil, and sulphur and cyanide gas.

Of late, however, *Gaurax aranea*, an insect related to the house fly, has been advanced as a natural enemy; it is said to feed greedily on Black Widows, especially if they are in the embryonic stage, boring within the cocoon, and gobbling up the tiny creatures. It was found in 1896 by Dr. A. Davidson; then lapsed into

obscurity, to be rediscovered by Professor W. B. Herms of the University of California, in 1934. He admits that "attempts to rear this parasite in the laboratory have



Two female Black Widows, showing the "hour-glass" markings.

so far failed, apparently owing to the inability to mate them under artificial conditions," and it must be realised that no effective control of this dangerous insect has yet been devised.

## Assassin Bugs

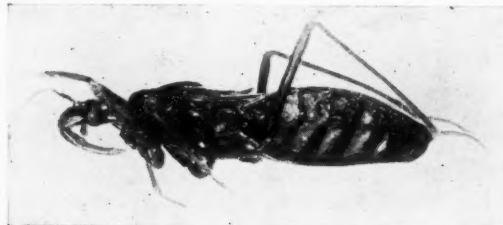
By Malcolm Burr, D.Sc.

PROBABLY not many entomologists know a little bug sometimes found in houses which has the curious habit of covering itself with a camouflage of dust, cobwebs or other stuff that comes in handy. From this custom of masking itself, it is aptly named *Reduvius personatus*. Its object, presumably, is to enable it the more easily to stalk its victims, for it is a greedy blood-sucker. Fortunately for us, it usually confines its attentions to other insects, and seems to have a special taste for bed bugs, its own not too distant relatives, but if it does happen to attack a man, it leaves no doubt about it. The bite is said to be as painful as that of a snake and the effect to last a week. This is probably due to the presence in the saliva of a powerful anticoagulin, which has been detected in some of its relatives.

Luckily, we are spared its big brothers, which can cause extreme pain, and even convey dangerous diseases. In Brazil there is one called *Triatoma megistus*, which has a very evil reputation. In some districts it is called the *barbeiro*, in others, the *chapanca*, and in others, the

*bicho de parede*, the wall bug, which gives a good idea of its habits, and recalls the Serbian name for the bed bug, *stenitsa*, which means the same thing. The *benchuca* of the Argentine, referred to by Darwin, is probably the same species. Unlike its relatives, the sting or bite of *T. megistus* is painless, and it has been known to feed on a sleeping child for ten or fifteen minutes without arousing it. Nor is there any subsequent swelling or local inflammation. It would perhaps be better if there were, for what it does is to transmit a fearful parasite, *Trypanosoma cruzi*, the cause of Chaga's disease, which is usually fatal. The symptoms are extreme anæmia, with wasting, enlarged thyroid and stunted growth, leading to fever, usually ending in the course of a couple of months with death. Even if the sufferer survives, the disease becomes chronic. Unlike the trypanosoma of sleeping sickness which multiplies in the blood, this one lives in the muscles and internal organs. The bug occurs in houses, chiefly hiding in chinks in huts, especially the thatched roofs of the native dwellings. The life cycle takes a year, and both sexes bite with equal virulence. The disease has been studied by Chaga, after whom it is named, and Brumpt, who has stated that a "serious social problem will be solved when the day comes that the economic value of man in rural sections of South America becomes superior to the expense of ameliorating his general hygiene."

A similar cheerful brute occurs in North America, where it is known as the "big bed bug" and the "assassin bug." It causes a burning pain that may last for several days.



*Reduvius Fedtchenkianus*, Osh., the "Torture Bug."

There are over 2,000 species of the *Reduviidae*, but fortunately not all have such baneful ways. A big central Asiatic species, *Reduvius fedtchenkianus*, also has semi-domesticated habits, for Nazaroff, who did not at the time realise what they were, was persecuted by them when taking refuge among some ruined houses in Turkestan. He reports that their bite was exceedingly painful. The old tyrants of Central Asia knew that and actually kept them for the purpose of torturing prisoners. This has been recorded in our general literature several times, in particular in the Marquis of Zetland's excellent book *On the Outskirts of Empire* (1904), where there is a grim description of the prison of the Emir of Bukhara, where, in 1842, two British officers, Colonel Stoddart and Captain Conolly, were tortured in a dungeon full of these creatures for several months before being pulled out and beheaded in the market-place.

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## African Mystery Beasts

By Captain W. Hichens

*Late of the Intelligence and Administrative Services, East Africa.*

EVERY white hunter who has trekked the African big-game trails has heard tell of strange marauding beasts of a kind that never figures on his game-licence, but which, so the natives say, prowl the dark trackways of the bush around the kraals, or lurk in the forest ways and swamps. In one's hunting camp, when the safari porters squat around the scrub-wood fire at night, they tell queer tales of these fearsome brutes; of the *ndalawo*, that grim, howling man-eater of the Uganda forests; of the *mbilintu*, a gigantic hippo-elephant of the Congo swamps; of the dreaded *mngwa*, that furry, silent-padded, purring lurker in the coconut-groves of the coast; of the *lau* and the *lukwata*, monstrous beasts whose hideous calls are heard booming through the grey night-mists of the lakes. And someone is sure to set the whole camp peering fearfully into the shadows with a tale of that grim night in the Masai country, when the *kerit*, ravenous and awful, raided the sleeping-huts—under the very nose of the white man—and dragged away its shrieking victim. These tales lose nothing in the telling. The flickering flames of the camp fire light up with furtive shadows the dark, mysterious wall of the surrounding bush; a slinking hyæna moans dismally, or the sharp startling yap of an inquisitive jackal punctuates the story; while tipsy little *komba*, the galago, breaks in with cackling, insane cries from his hiding in some camp-side tree. The porters huddle closer to the fire; the white man casts a reassuring glance upon his guns and pours himself a *chota* peg . . . on such nights prowls *kiret*, the devil-beast of darkness!

It would be easy to dismiss these stories as mere figments of the black man's night-terrors, born of ignorant superstition, or perhaps phantasms due to sitting too long over camp fires and too near to a warm *ntulu*-beer pot. But that would be a rash conclusion. For these "mystery" beasts, in some form or another, do exist; they prowl, they howl, they lurk, they leap, they kill. So, although one may say that the horrible *mngwa*, as the fear-stricken natives of the coastal fishing-kraals describe it, must be a

myth, there is no blinking the fact that a stretcher-load of clawed, mauled and mangled man dumped at one's tent door, is no myth at all: and call it *mngwa* or what you will, the beast which attacked him is no



*This is how an African native woodcarver sees the Lau, the monster of the Great Lakes.*

myth either, but patently an animal of the kind which it is best to interview with the business end of a .450.

Nor is the African native a fool in the ways of the bushveld and its beasts; he does not assert that a beast is an *mngwa* when any old woman in the kraal

could tell by a glance at its spoor or by the way it attacked that it is a lion, a leopard or a hyæna. Native hunting lore clearly distinguishes the bush beasts. One well-known hunting-song tells of the *simba* (lion), *nsui* (leopard) and the *mngwa* all in one verse, plainly showing that there is no confusion in the native mind between these three great carnivores. Moreover, many white hunters, settlers and officials, whose *bona fides* cannot be doubted, have spooed, heard, shot at and sometimes even seen and grappled with these mystery monsters; and very occasionally one of the "mythical" beasts is



*Some hunters believe that most of the mysterious marauders are merely old hyenas. Here is one trying to slink backwards out of a camp which he had a notion to raid.*

shot or trapped, as happened with the *nsui-fisi* recently. Then the natives say, "We told you so!" and zoologists scratch their heads and mutter, "*ex Africa semper*, etc.!" But most of the mystery animals have not yet



fallen to the gun. Like the okapi, which long was classed as the purest of myths, they are elusive customers. A roar, a howl, a shattering of kraal-poles, bellowing of oxen, screams of terror . . . the beast has come: the beast has gone.

Typical of them and their manner of raiding stock or human quarry is an unknown beast which, for some time past has been wreaking havoc over a large tract of the north Cape Province and Transvaal. No one has seen the animal, but its spoor is known and its savage depredations have caused widespread alarm. The natives call it the *khodumodumo*, or "gaping-mouthed-bush-monster." In stealthy silence, under cover of the darkest nights, this marauder invades the kraals and farms, clambers over the six-foot palisades which pole in the cattle-byres and stock-pens and then, seizing a sheep, goat, or calf, leaps back over the fence, to disappear with its quarry.

### A Silent Raider

Its spoor on the kraal pathways and bushveld tracks only serves to shroud the marauder in deeper mystery. Its footprints are "round, saucer-like spoor, with two-inch toenail marks," a pug which has so far puzzled hunters to identify, since it does not fit the paw of any known wild beast that raids stock. The *khodumodumo*'s attacks were especially predatory in the Graaffreinet area, where a posse of over a hundred settlers turned out to hunt the beast down, a large reward having been placed on its head. Views as to what it was varied widely; some held that it was a "freak" hyæna; but others objected that hyænas always *drag* their quarry; and, certainly, no one has ever heard of a hyæna leaping a six-foot fence with a calf in its jaws. More, the hyæna is a noisy thief, moaning before a kill and shrieking like a demon afterwards; and this beast is silent. The leap-and-grab attack pointed to a lion or a large leopard. Some lions do raid silently, and I have more than once known them jump a six-foot kraal fence and carry off a beast; for their strength is colossal. But they always grunt in a husky undertone during the kill and often roar later; often they try to stampee corralled stock by roaring at them. This beast was silent.

Many of the hunters in the posse, too, were old hands who would at once recognise lion or leopard spoor, quite apart from scent and other clues. But the *khodumodumo* has not yet been caught and a useful reward awaits the hunter lucky enough to get this uncanny raider. It is not impossible that the *khodumodumo* may yet prove to be an animal hitherto unknown. The *nsui-fisi* was a brute of a similar kind.

Its name means "leopard-hyæna," and many hair-

raising tales are to be heard of it in Rhodesian kraals. For many years natives have told white hunters of this beast, averring that it was incredibly cunning, swift and ferocious, as one would expect of a hybrid "killer" combining a leopard's ferocity with the hyæna's slinking guile. It always attacked, the kraalsmen said, at night, and smashed its way through the flimsy doors or roofs of stock-pens, making off with goats and sheep, and often turning the pens into a veritable shambles. It was like a leopard, the natives declared, but instead of being spotted, it was barred, white and black, like a zebra, and not unlike a striped hyæna. But no such beast was known to white hunters and so the *nsui-fisi* was pooh-poohed into the limbo of "it's just native superstition, of course!"

In this case, however, the native was right. No less an authority than Mr. R. I. Pocock was able to lay on the table of the Zoological Society not long ago, a skin of the *nsui-fisi*, one of a number obtained in Rhodesia. It was shown to be a new species of cheetah (*Acinonyx rex*), not spotted, but striped like a zebra, as the kraalsmen had been saying for many years! As Mr. Pocock remarked, it was "most extraordinary that so large and distinct a species should remain for so long unknown." The natives were wrong in supposing the *nsui-fisi* to be a leopard-hyæna cross, but that is certainly what it looks like to anyone other than a skilled zoologist. It would thus be rash to assert that other "mythical beasts" like the *nsui-fisi* cannot exist, and it is by no means impossible that the *mngwa*, *kerit*, and *ndalawo* may yet prove to be as real. By description all these beasts are well known.

### The Terror of the Coastlands

The *mngwa*, according to natives in the fishing villages strung along the East African coast, is a gigantic cat, striped like a tabby, but as large as a donkey and far more ferocious and fearsome than any lion. It can be said that such a beast is "impossible"; but, having trekked many a long mile in its reputed haunts and helped to patch up more than one of its mangled victims, I am convinced that some beast answering to the *mngwa*'s description does lurk in the dense jungle which fringes parts of this coast. Patches of this dark jungle-growth have not been trodden by human foot for centuries, as may be judged from the fact that a large town of ruined stone mansions has stood in the bush not an afternoon's car-drive north of Mombasa, for over five hundred years, and was utterly unheard of until rediscovered about four years ago. What other secrets does this jungle-belt hold? The natives swear that it is haunted; and so it may be, by strange beasts. In any event, the *mngwa*, as a beast distinct from the lion and

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leopard, has been known to the coastal natives for more than six centuries. A 13th-century song of one of their famous hunter-sultans contains the lines :

" I do not dally in the towns, but press into the forest, to be devoured by the *mngwa* !  
And if the *mngwa* seizes me, devouring my flesh, that is the fortune of the hunt ! "

Down the years the beast figures in stories, and any native on the coast to-day can tell horrible tales of the *mngwa's* ferocity and periodical raids. All that is not to be lightheartedly dismissed as " nonsense." Not long ago a man was brought in to me at Mchinga (a small Tanganyika coastal village), on a litter and terribly mauled by some great beast. He said it was a *mngwa*, and as he himself was a brave and skilful native hunter, who had often tracked down lions, leopards and other " killers " with me and other white men, why should we suppose that in this case he mistook a lion or a leopard for some other beast ? He had nothing to gain by telling me lies ; on the contrary, as a hunter he depended for his livelihood on being absolutely truthful and trustworthy. On another occasion, at Lindi, another Tanganyika town, a *mngwa* took to prowling the village at night, killed several villagers and, finally, a policeman on point at the market. For nights the whole town lived in fear, and although we doubled the police-guards we had difficulty in getting the men to go on duty. But I have seen those same men rout a lion out of a bush-patch with sticks ! They swore that this beast was not a lion, nor a leopard, but a *mngwa*. We made every effort to waylay it, but, unfortunately, were not successful ; nor did we get a lion, as we might reasonably have done had it been one.

### The Nandi Bear

The *kerit* is another monster which, in some form or other, unquestionably exists and remains to be discovered. It is sufficiently notorious under the name, " The Nandi bear." On the Kenya coast the natives call it the *dubu* ; the Lumbwa, up-country, call it the *getet*, and the mere mention of it evokes cries of horror throughout the East African kraals as far west as Ruanda, where it is known as the *ikimizi* and, elsewhere, as the *kibambangue*. It would be stupid to assert that this widespread native belief in the *kerit* is mere baseless superstition. The *kerit* is the author of numerous raids of the most frightful description. I have heard it described as a beast, half-man half-gorilla, breathing fire, with one flaring eye in the centre of its head, and emitting a fearful yowling howl. That is the *kerit* as terror sees it. But as to the howl I can testify, having heard it and having shared the experience of many other white men in hunting the monster. Though it does not always howl, it always attacks under cover of

dark, moonless nights and with the swiftness and ferocity of a veritable devil. It is certainly not a lion or a leopard. The *kerit* will plunge into the thick of a six-foot thorn zareba (a " wall " of piled spiked and hooked thorn-scrub), whereas lions and leopards are very chary of tackling such a defence, the tangled thorns in which painfully lacerate their tender pads and muzzles. I have known man-eating and cattle-snatching lions leap over zarebas ; but I have yet to hear of a lion boring through one as the *kerit* does, like a mole through earth.

### Six Pads and Six Claws

Again, the *kerit's* spoor is nothing like a lion's or leopard's pad. Opinions vary upon it, but there is a body of evidence that this astounding beast leaves a pug-mark with six pads and six claws showing on each paw. I was assured of that as long ago as 1912, and since then, with other hunters, have seen this unbelievable spoor at more than one kraal where the *kerit* has raided. Many white hunters have actually seen and shot at what has been thought to be a *kerit*. One of the best accounts is that of Major Braithwaite and Mr. C. Kenneth Archer, two well-known Kenya colonists, whose experience and word are not lightly to be imputed in such matters. They saw the animal in grass and scrub and took it for a lioness ; later, a side-view of its head gave the impression of a snout, the head being very large, while the beast stood very high forward, 4 ft. 3 ins. to 4 ft. 6 ins. at the shoulder. " The back," they say, " sloped steeply to the hindquarters and the animal moved with a shambling gait which can best be compared with the shuffle of a bear. The coat was thick and dark brown in colour. Finally, the beast broke into a shambling trot and made for a belt of trees near the river, where it was lost." Many other observers have given similar accounts of the *kerit*.

The beast may be, as some suggest, an enormous hyæna ; and an hyæna which stood 54 inches at the shoulder would indeed be enormous ! But one of the *kerit's* tricks is to lie up in trees and, waylaying natives passing on the track below, to reach down a hairy paw and rip open their skulls. No hyæna can do that. Some of us who have hunted the brute share the view that it may be an anthropoid. Its raids invariably occur on the skirts of forest land, which might be the haunt of one of the great apes. To those who would object that the apes are not man-killing carnivores, the answer is that one is not so sure ; the chacma baboon is a desperate " carnivore " and is a serious menace to sheep-farmers in South Africa, where the baboon-packs raid the flocks, ripping up the lambs with their long-clawed thumbs and lion-like fangs and carrying off the carcasses to their kopje haunts. Be that as it may, the

Game Warden of Uganda, who speaks with an intimate knowledge of the fauna, may have the final word. He says, "I believe in the Nandi bear; it may be a giant hyæna; it may be something different from anything we know." In any event, some fearsome monster, named *kerit*, lurks the forests of East Africa and yet awaits capture and identification.

The same is true of the *ndalawo*, a fierce man-killing carnivore, the size and shape of a leopard, but with a black-furred back shading to grey below. Here again, the disbelievers say, "It is a hyæna"; but this hyæna explanation becomes somewhat threadbare when so glibly put to every mystery. Hyænas are cowardly brutes. They do attack humans occasionally when in packs; and sometimes a lone hyæna will sneak in and snatch away a child. But there is nothing in this dodge-and-sneak behaviour comparable with the ferocity of *mngwas*, *kerits*, and *ndalawos*. Natives, moreover, are not afraid of hyænas, and any old dame in the kraal is prepared to shoo them away.

### Water Monsters

In quite a different class of mystery animals are the water-monsters, the *lau* and the *lukwata*. These may be one and the same animal. The *lau* is an immense water-serpent, which is said by the natives to haunt the swamps of the Nile, around Lake No, and the depths of other lakes and marshes. They describe it as an enormous snake, up to a hundred feet in length, with the body-girth of a donkey. Here again, terror of the monster has adorned native stories of it and one hears that its eyes flash deadly fire and that it feeds on men and large animals, which it seizes with monstrous bristling tentacles protruding from its muzzle. At night it makes a loud, booming cry and a rumbling noise like the typical after-dinner rumble of a herd of elephants. There are, of course, large water-snakes in Africa, and one shot in Tanganyika a short time back by a Greek settler is said to have measured forty feet in length, though this is questionable. Natives declare that the *lau* takes heavy toll of men and cattle, and various white men have recorded both seeing and hearing monsters that may be *laus*. The late Sir Clement Hill has described how, in the gulf near Mount Homa on Victoria Nyanza, a monster rose up from the lake and tried to grab the native who was on look-out on the prow of the steamer; it was the man's cry which attracted Sir Clement's attention.

He particularly noted the monster's long neck and small head, and it was, the natives averred, the *lukwata*, the lake monster that attacks fishermen. Grant, the explorer, saw a similar beast near Jinja, and only recently Mr. E. G. Wayland, Director of Geological

Survey in Uganda, recorded that he was shown a fragment of alleged *lukwata* bone. He found belief in the animal very strong in the Kavirondo country, where the natives said that the *lukwata* fought with crocodiles and thus lost pieces of its body, which were highly prized as charms. They, too, asserted that its booming voice can be heard at great distances, and Mr. Wayland states that he has himself heard it and can offer no other explanation than the native one, that it is the voice of the *lukwata*, whatever the monster may be.

### Colossal Lizards

The largest, most frightful and least credible of all the African mystery beasts is the *mbilintu*. Its very name means, "the frightful unknown monster," and it is said to be an enormous elephant-hippo-like beast which haunts the Congo swamps and the regions of lakes Bangweulu, Mweru and Tanganyika. Native accounts of it vary widely. From some, it might be a Chalicotheres, that remarkable beast of the late Miocene period, with a horse-like head, and toed, clawed "hoofs," a horse-cum-sloth creature in appearance. Other accounts speak of a gigantic lizard, with a neck like a giraffe, legs like an elephant's, a small snake-like head and a tail thirty feet long. Several white hunters have asserted that they have tracked what must be such beasts, and the Smithsonian Institution some years ago sent an expedition to locate this animal, but the project, unfortunately, met with disaster and never arrived in the field of search. Likewise, the chief Lewanika reported years ago to the British Resident in Zululand that a huge lizard, "ten times as big as a crocodile, which has made a trail in the reeds like that of a large trek-wagon from which the wheels had been removed" (he meant, made by something large dragged along, and the size of what to him was the familiar Boer veld wagon), and that he had given strict orders to his warriors to keep watch for the beast that he might see it for himself; but it was never seen again. The natives still talk of this monster under the name *isiququmadevu*.

### A Mystery Explained

Of the small fry, there is an endless number of animals concerning which the African savage can tell extraordinary tales. One was the *mlularuka* or "flying jackal," which, the kraalsmen said, was just like a jackal except that it had wings to *ruka kama popo* (fly like a bat), and that it often flew in their fruit-gardens, raiding mango trees and pomegranates and crying out loudly in the dusk. No one believed it. But Mr. Loveridge found not only one, but two species of *mlularuka* when he was collecting for the Harvard Museum in Tanganyika in 1927. They were two

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entirely new species of flying squirrel, and one at least is over two and a-half feet in length!

A beast over which controversy rages at this moment is the "crowing crested cobra," which, the natives say, is a snake, like a cobra, with a crest on its head and a loud, distinct cry like the crow of a cock. Mr. Boulenger and other authorities declare it impossible; on the other hand white hunters and others swear that they have heard it and other snakes, which not only crow but make a variety of calls ranging from a "bell-note" to a continuous "bleat like a deer!" This reptile has yet to be caught.

### The Little Furry Men

Lastly, there are mystery men-beasts, such as the *agogwe*, little furry men, which are said to lurk in the Ussure and Simbiti forests on the western side of the Wembare Plains. Some years ago I was sent on an official lion-hunt to this area and, while waiting in a forest glade for a man-eater, I saw two small, brown furry creatures come from the dense forest on one side of the glade and disappear into the thickets on the other. They were like little men, about four feet high, walking upright, but clad in russet hair. The native hunter with me gaped in mingled fear and amazement. They were, he said, *agogwe*, the little furry men whom one does not see once in a lifetime. I made desperate efforts to find them, but without avail in that well-nigh impenetrable forest. They may have been monkeys, but if so, they were no ordinary monkeys, nor baboons, nor colobus, nor Sykes, nor any other kind found in Tanganyika. What were they?

The natives of the local villages told me strange tales of them; how, if one put out a gourd of *ntulu*-beer and a bowl of food in the grain-gardens, these little folk would take the food and do some hoeing and weeding at night, as thanks. That, I can well believe, is myth; but my little brown men were real enough. They may yet be found. One could tell as yet other mysterious creatures, the *irizima* of the Congo; the *ngagia*, the *chiruwi*, the *kitunusi* and the *ngojama*; some are definitely mythical, but it would be rash to aver that all are so. One must not forget that the okapi was once a "mythical beast" and once no one believed in the platypus or in Tibet's giant panda. Yet all these have been proved to be "real." So with the mystery beasts of the African bushveld and forest-ways, they may be improbable, but they are by no means impossible; and the afternoon may well be near when, at the hair-raising hour when the Zoo broadcasts its jungle voices on the wireless, we shall hear in our homes the hideous snarl of the *mngwa* and the spine-freezing howl of the *kiret*.

### The Bêche-de-Mer for the Table

(Continued from page 366)

about six inches long and no thicker than a safety-match. Whenever a larger fish appears on the scene, the little things dart back into their strange home, within the bêche-de-mer's tail! This oddity is to be seen only with the large black and brown bêche-de-mer.

Trepang fishing is Australia's oldest industry. No one can say with any degree of accuracy when trepang fishing did begin in these seas, but it was long before Australia was known to the white man, for recent discoveries of ancient documents in China indicate that as far back as the year 1426 junks from China visited the seas off the northern coast of Australia regularly every year for the purpose of collecting bêche-de-mer. At any rate, for over seventy years bêche-de-mer fishing has been one of the most important sea-industries of tropical Australia. The trepang boats are chiefly two-masted luggers of five or six tons burden, and their crews consist of from ten to fifteen natives, who work from small dinghies, which they paddle about until they sight bêche-de-mer, which are easily distinguished against the sandy sea-floor. The natives then commence diving, and as they are procured the bêche-de-mer are placed in bags or baskets, being later transferred to the "mother" vessel to be cured.

### A New Metal-Polish

The curing is done either on board the "mother" vessel or on a near-by island. Each bêche-de-mer is slit open longitudinally and thoroughly cleaned, then boiled in water until the saltiness of the flesh is removed. Incidentally, this boiling gives the water remarkable properties. Clothing dipped in it before washing loses every particle of grease and dirt, and it will polish brass and copper to a brilliant lustre. After boiling, the bêche-de-mer are flattened out and small sticks of bamboo placed in the slits to keep the flesh apart. They are then placed in the sun to dry. When most of the moisture has been evaporated by the sun, the bêche-de-mer are cured over a smoky fire of red mangrove wood. The curing takes about two days, and the process turns the trepang into small, hard, flattish lumps, which look for all the world like so many pieces of badly charred beef-steak. The bamboo sticks are then removed, and the bêche-de-mer packed for export.

The Australian trepang industry owes its existence solely to the demand for the bêche-de-mer in China; the creatures have never been used for food by white people, which is somewhat surprising, since, despite their somewhat repugnant appearance, the bêche-de-mer make a tasty and nourishing soup.

## Correspondence

### Birds and Telephone Wires

To the Editor of DISCOVERY.

Sir,—The interesting information contained in DISCOVERY (October, 1937), relating to injuries sustained by birds colliding with telephone wires, etc., prompts me to suggest another more probable explanation of the inability of birds to avoid, in some cases, these obstructions.

The reason lies, I believe, in the fact that thin, isolated, horizontal wires cannot be viewed stereoscopically by birds or, for that matter, by any being having two eyes placed in a horizontal line.

This means that, although an approaching bird may appreciate the level (or height) of a wire, it cannot accurately estimate how far the wire is distant.

It follows, therefore, that a bird flying at the same height as a wire will, in all probability, mistime the moment at which to avoid the obstruction.

Man is in the same plight in respect to this fundamental defect in vision. The natural conditions in which our eyes have evolved have produced nothing corresponding to the horizontal wire. Any object or part of an object which is horizontal in nature has, as a rule, a very definite vertical component and on that account the eyes are able, except at long distances, to gauge its position relative to other objects.

An interesting experiment may be carried out in this connection by stretching, at eye level, a thin piece of string or wire across an open space and approaching it from a direction at right angles to its length. It will be found impossible to judge with any degree of accuracy its position in the horizontal plane.

The difficulty is overcome, to a great extent, by attaching beads or corks—some black and some white—to the wire. Some of these will then contrast with the background and their relatively large vertical dimensions, compared with the wire, will give more scope for employing the inadequate binocular vision concerned.

Yours faithfully,  
F. J. C. BROOKES.

Sunbury-on-Thames, Middx.

### Bird Migration

To the Editor of DISCOVERY.

Sir,—Mr. A. R. Tripp's article on this subject in DISCOVERY for November is most interesting and stimulating to thought. I think most ornithologists agree that there is no single explanation of bird migration. It more probably arises from a combination of forces.

The question of how far it is controlled by cosmic radiations is one which can only be answered after long and patient investigation. Dr. Landsborough Thomson, in *Problems of Bird Migration* (written in 1926) says "Magnetic phenomena have been suggested" (as a factor) "but no evidence exists which seems to give any probability to such a theory."

As to the food factor in migration, what is most important is nestlings and fledglings, rather than for the adults. The nestlings of some seed-eating species are fed entirely on soft food.

Yours faithfully,  
E. W. HENDY.

Porlock, Somerset.

### "Bombing the Terns"

To the Editor of DISCOVERY.

Sir,—As the writer of the letter on the Chesil Bank, which appeared in *The Times* of October 2nd last and which is referred to in the November number of DISCOVERY, will you allow me to say that the comment therein is inaccurate and misleading?

The colony of the common tern at Dungeness is not becoming encroached on by buildings: it is, in fact, situated on a shingle beach which is part of a very large acreage in the possession of The Royal Society for the Protection of Birds and it is, in the strictest sense of the term, a bird sanctuary.

Moreover, the common tern cannot be said to be in danger of extinction in England—there being several large colonies on both the east and west coasts: also, of course, in Wales and Scotland.

It is, however, a fact that a much rarer species of bird, the Kentish plover, has recently become practically extinct by reason of bungalow building at Greatstone, situated between Dungeness and Littlestone, this being its only known breeding locality in England.

Yours faithfully,  
J. B. WATSON, M.B.O.U.

Milford-on-Sea, Hants.

### Cruel Skinning

To the Editor of DISCOVERY.

Sir,—Eight years ago I founded a campaign against the cruel trapping of animals for their furs; and have now distributed 705,000 leaflets. These are sent out free of charge and include a White List of those furs that have been obtained with a minimum of cruelty and can therefore be worn with a fairly clear conscience.

This summer I wrote to the Association for the Preservation of Game in U.P. India, asking for any authentic information about live-skinning, which is about the greatest cruelty that it is possible to imagine.

The following is the Secretary's reply:

"Live-skinning of goats, sheep and reptiles is still practised in India. I fear it is mostly done in parts of Kashmir, N.W.F. Provinces and among backward tribes in India and States. I am afraid I cannot give you any authentic information at present, as I did not consider it necessary to have it—knowing full well that the barbarous practice is not uprooted by the Government of India or the States. Most of the people here know that the practice is diminished but not entirely stopped. Pigs, snakes, lizards, and sometimes goats are common victims. Plucking of live birds is also common, and so is the practice of removing scales and skin from eatable live fishes."

In view of the above no lamb skins from India can be recommended or reptile skins for ladies' shoes and hand-bags. I should be grateful if readers of DISCOVERY would help me in carrying on this much-needed campaign.

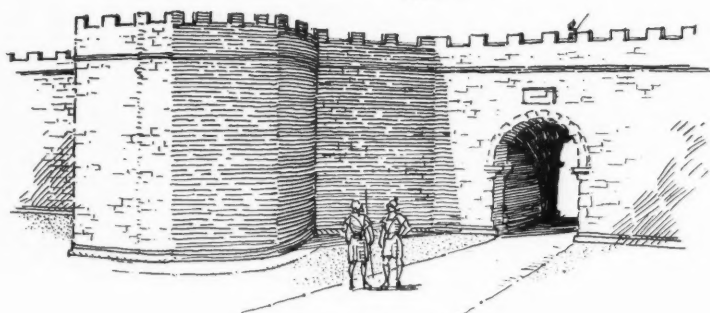
C. VAN DER BYL (Major),  
The Fur Crusade & Humane  
Trapping Campaign.

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# PETUARIA

By Philip Corder, M.A., F.S.A.



[Drawn by Paul J. Brown.]

*Reconstruction of the East Gate of Petuaria.*

ABOUT A.D. 160 the geographer, Ptolemy of Alexandria, made a list of some thousands of places in the Roman Empire, giving their latitudes and longitudes. In the section dealing with Britain he records a town named Petuaria in the territory of the Parisi, a tribe who inhabited East Yorkshire. It was long ago conjectured that this place lay at Brough on the north bank of the Humber, where the Roman road, known as Ermine Street, crosses the river and proceeds along the western edge of the Yorkshire Wolds to Malton (Derwentio?), with a branch across the level plain to Stamford Bridge and thence to York (Eboracum). Until the summer of 1937 this identification remained a conjecture only. The frequent finds of coins and potsherds at Brough were proof of a Roman occupation of some sort, but nothing visible remained to indicate its nature.

Even two centuries ago little more was to be seen. The indefatigable Horsley in his *Britannia Romana* (1732) includes an account of the place written by a friend, which is substantially true of the modern village. It ran as follows:—

"I have been twice to Brugh, and both I, and the gentleman who was with me, thought it very probable that it had been Roman, though now much defaced. It is but a very little town and stands pretty near north and south, and about the length of one side of a common station. The one side of the town, which consists but of two or three scattered houses, seems to stand on the west rampart: and for about 50 or 60 yards there is somewhat very like the foundation of a rampart appears. Beyond the other side of the town are gardens and orchards; but yet in several places there appears some uneven ground like little foundations, and actually I saw a little square foundation (the first time I was there) just dug up, which is now covered with earth and made fit for a garden. The ground is pretty high and firm, and seems proper for such a place."

Excavations farther north at Malton in 1927-30 revealed a great fortress that had been occupied from the time of Agricola until the end of the Roman period.

Recent excavations at Brough, in Yorkshire, on the Humber, have brought to light some exceptionally interesting information concerning the small provincial Roman town of Petuaria. An inscribed stone, unearthed this year, not only confirms the name of the place, but tells us its status, and proves the existence of a theatre, the site of which is so far undiscovered.

Moreover this lay within a much larger camp which had preceded it, large enough indeed to suggest that a legion had been stationed here during the early campaigns of Petillius Cerialis against the warlike Brigantes who inhabited the north of Britain. Such a force must have advanced from Lincoln, where we know the Ninth Legion was in garrison after A.D. 47, until it was moved to York thirty years later. Brough is an intermediate point on this route at the crossing of the Humber. A fortified site was there identified in 1933, and in the past five summers the history of the town has been gradually pieced together. Last August the discovery of the fine slab, described below, enabled us to confirm the conjectures of earlier antiquaries, and to place Petuaria of the Parisi on the map. Great changes have taken place at Brough during these five years. Formerly a quiet village with a population that must have been stationary for centuries, it has recently grown rapidly, following the development of a large aeroplane factory close by; and before long it is likely that Petuaria, like so many other Roman sites, will lie beneath the gardens of modern bungalows.

The ramparts of the town are mostly covered with houses and gardens, as indeed they were in Horsley's time 200 years ago, but a level field, known as the Bozzes Field, including about a quarter of the little town and a large part of its eastern defences, has been available for excavation. Here, among the hen-houses that covered the level surface of the field, the meagre remains of Roman streets and houses have been revealed and their history recovered.

The town first came into existence, after the middle of the 1st century, as a haphazard kraal of native huts. When in A.D. 47 Ostorius Scapula established the Roman frontier on the Fosse Way, the line of which extends from the coast of Devon to Lincoln, where the Ninth Legion was stationed, the Humber must virtually have

constituted the northern frontier. Trade with the Parisi, who seem always to have been friendly to the Roman advance, must have attracted the villagers of the Wolds to the north bank of the river. Possibly fear of their warlike and powerful neighbours, the Brigantes, may have led them to welcome the protection of the Roman arms. Although their huts were primitive enough, they themselves were by no means uncivilised, and their domestic pottery, much of it of local manufacture, is fine in texture and finish, and often bears a resemblance in form to that of the Belgæ of south-eastern Britain. In due time they came to use the beautiful decorated Samian wares of southern Gaul. In short, they learned to make use of the equipment of Roman life long before they became dissatisfied with their squalid dwellings.

In A.D. 71 Petillius Cerialis, legate of the Emperor Vespasian, undertook the conquest of the Brigantes. Advancing from Lincoln along Ermine Street, he crossed the Humber at Petuaria and established a base-camp, where supplies could be concentrated before he advanced along the Wolds to Malton with his main body. The camp that he established had a rampart of laid turves, a considerable length of which has been identified

to the north of the East Gate of the later town. In front of this turf bank was a V-shaped ditch, which may be seen in the photograph on p. 378, running beneath the 4th-century bastion. It has even been possible to identify traces of the timber-work which once formed the palisade crowning this temporary earthwork.

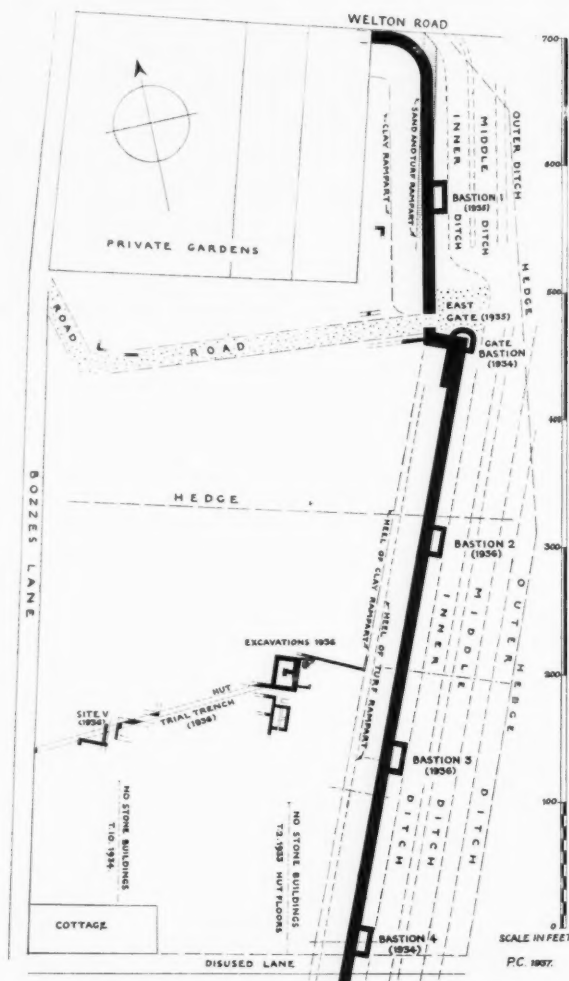
Once, however, the great fort at Malton was built, and

the legion established in its new advanced base at York, no military post can have been any longer required in the territory of the friendly Parisi, and the subsequent history of the site is that of the development of a small tribal capital.

As elsewhere in Britain, early in the 2nd century, the

Petuarians set about rebuilding their little capital in Roman fashion. Before the buildings of their dreams could rise in stone, the old huts had to be swept away, and in places their débris was deeply buried under a spread of clean sand. Petuaria was to be a new town. Massive foundations were laid on which their new buildings were to be reared. But their hopes were not to be realised, and although some of the new houses were completed, others certainly never got beyond their foundations. What exactly happened is still in doubt, but towards the end of the second decade of the century there must have been serious trouble in the Pennines, for the Ninth Legion disappears from history, whether destroyed in battle or cashiered for failure may never be known. Early in the reign of Hadrian its place at York was taken by the Sixth Legion which remained there until the end of the Roman occupation. Obscure though these events are,

they are mirrored in the buildings of our little town. When building operations were again resumed, the defences first received attention. So secure had the Petuarians been in the Pax Romana that no attempt seems to have been made to defend the earlier town. Now they dug around it three great ditches and erected, on a firm foundation of flat stones, a rampart of laid turves.

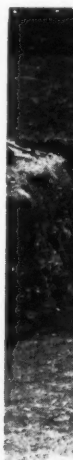


Site Plan of Excavations at Petuaria, 1933-1936.

From Excavations at the Roman town at Brough, E. Yorkshire, 1936, by courtesy of the Hull Museum.

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The line chosen for the new rampart necessitated a razing to the ground of some of the earlier buildings. Moreover, when they came to build upon the massive foundations that had been so hopefully laid, their work was poor and hasty, and in places the earlier planning was not adhered to.

Before many years had elapsed, in the reign of Antoninus Pius, the Petuarians, perhaps following fashion rather than necessity, set to work to remodel their walls and gateways in stone. Following exactly the line of their turf rampart, they built a massive stone wall, nearly ten feet thick, to take the place of its sloping outer face; and behind this wall, and over the earlier turf, they piled a bank of red clay, twenty-five feet wide. The East Gate was of a peculiar design, unparalleled in Britain, for here the turf rampart, following approximately the line of the defences of the much earlier military base-camp, had taken a change of direction which necessitated an awkward recessing of the gate. This was now rebuilt in stone, a single arch eleven feet wide taking the place of the earlier gate, which had no doubt been a timber construction. Within the town other buildings were being erected. In 1936 we uncovered a rectangular centrally-heated room, seventeen feet by nineteen, beneath the flagged floor of which ran flues carrying the heat from a furnace outside its walls. Near it was a rectangle of large flags that had probably once enclosed a leaden tank. Around this were strewn the shells of many winkles, mussels and whelks. This year in another part of the town we laid bare the ruined walls of a simple rectangular house that had been rebuilt, partly on earlier foundations, at this time. On its walls were still fragments of the coloured wall-



[Photo. by Rev. T. Romans.]

Part of a town house of Petuaria showing slots in the floor for partitions of lath and plaster.



[Photo. by Rev. T. Romans.]

Inscribed stone recording the gift of a stage to Petuaria by M. Ulpius Januarius in the reign of Antoninus Pius.

plaster that had adorned them, arranged in red and blue panels demarcated by white and blue lines. The house had been divided into rooms by lath and plaster walls, the sleeper-beams for which were let into shallow trenches in the chalk or gravel floors.

Near to this building was found a large inscribed slab, originally about four feet long, having upon it ten lines of lettering. It is the only Roman inscription that has been found in Yorkshire for eight years, and, in the amount that it has to teach us, it is perhaps as important as any ever found in the county. The inscription runs as follows:

OB HONORem  
DOMVS DIVInae  
IMP CAES T AELI hadri  
ANI ANTONINI Aug pii  
P P COS /////  
ET NVMINIB Aug  
M VLP IANVARIVs  
AEDILIS VICI PETVar  
PROSCAENium /////  
DE SVO /////

It is dedicated to the honour of the Divine House of the Emperor Antoninus Pius and to the Spirits of the Deified Emperors by Marcus Ulpius Januarius, ædile of the village of Petuaria, and commemorates the provision of a stage for the community at his own expense.

It is difficult to exaggerate the importance of this discovery. Few places in Britain have had their Roman names determined by



epigraphic evidence. But this stone has much more to tell us than the name of the town. Although Petuaria is styled a "vicus" or village, yet it had municipal government on the Roman plan, and Marcus Ulpius Januarius, its ædile, or sheriff, as the title may be rendered, commemorates his election in true Roman fashion by the gift of a public building to his fellow-citizens. It is evident that soon after A.D. 138, when

Lincoln to York, via Brough, must have declined in importance, and thereafter East Yorkshire seems hardly to have belonged to the military zone at all, but to have been left to develop its own civil life in peace. Petuaria must have remained a market for trade with the villagers of the Wolds, and to have been a centre—small though it was—of Roman culture. But throughout the 3rd century in Britain town life seems to have declined



[Photo. by Rev. T. Romans.]

*Foundations of a 4th century bastion in front of the town wall of Petuaria. Beneath it may be seen the ditch of the first century military camp.*

the dedication was made, the town had become of some importance, and may indeed have begun to take over the functions of the tribal council of the Parisi. Only one Roman theatre is known to exist in Britain—the fine structure recently excavated in the city of Verulamium (St. Alban's). Tacitus mentions another at Colchester, but this stone provides the first proof that similar, if humbler, structures existed in the smaller towns. An inscription on stone need not have been affixed to a building constructed throughout in masonry; the Petuarian audience may have sat on benches of wood.

The meaning of the name Petuaria in Celtic is not in doubt. It is allied to the word *pedwar*, four, and indicates that at first Petuaria was the chief town of one quarter of the tribe. Although it never grew to any size—the defences enclose an area of little more than twelve acres—it seems nevertheless to have become the capital of the whole tribe.

After the establishment of a fortified frontier in the north by the middle of the 2nd century, the route from

Malton and York, shows evidence of this. Probably it was at this time that the defences were strengthened by a series of rectangular towers or bastions, placed at intervals along the face of the town wall, while the Gate received a semicircular or multangular defence tower. The building of so heavy a foundation on the very lip of the inner ditch involved the filling of this with a packing of stiff red clay, and the digging of a fresh ditch farther from the foot of the wall.

Little more can be said with certainty. Towns like Petuaria show few signs of having survived the incursions of the Picts and Saxons who overran the country towards the close of the century, although the farm-houses of the Wolds still flourished under the protection of the Signal Stations planted at intervals along the coast. Few relics are left to indicate to us what became of Petuaria before its final extinction in the 5th century. Its modern name of Brough perhaps indicates that the shell of its walls was still standing when our Saxon ancestors finally settled in the north.

in importance, while the farms or villas of the countryside continued to flourish. There is little evidence of building activity in the town at this time. In A.D. 288 Carausius, a native of the Low Countries and a successful admiral, seized the imperial power and ruled Britain for a time with vigour and ability. After his assassination by one of his own officers six years later, the legitimate Cæsar, Constantius Chlorus, came in person to Britain and reconquered it. Many Roman sites in the north suffered serious damage during these civil wars, and everywhere rebuilding was in progress early in the 4th century. Petuaria, like the great neighbouring fortresses at

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## Recent Advances in Biophysics

By Frank W. Britton, D.Sc., Ph.D.

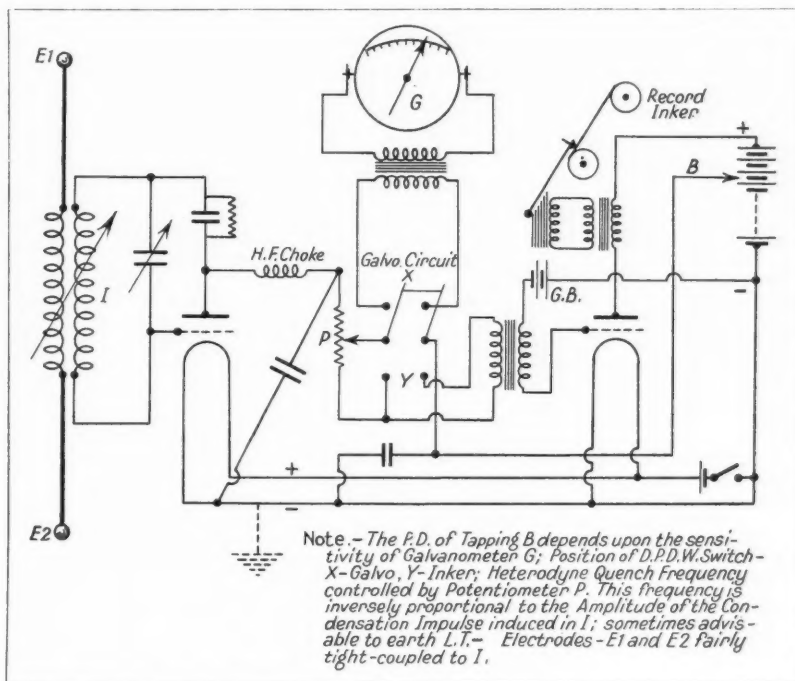
*The examination of biological problems by physical methods is an important modern scientific development. Some of the most recent experiments are here discussed.*

RAPID strides have been made in the manufacture of apparatus and the development of technique in the use of instruments for the measurement of minute currents of electricity—especially where these are concerned with the living body. Where there is life there is also (in addition to hope) electricity, for living bodies are literally store-houses of electric energy, the amount of which it would be extremely difficult to measure, although we may arrive at some fairly accurate results regarding the amount of energy on the *surface* of the body. A property of the nervous system is response to stimulus and this response is the cause of distinct variations in the electrical resistance of the body, so that resistance measurement is an important factor in reflecting the state of the nervous system and may be used to indicate the effect of fatigue due to exercise, mental or physical.

Without going into detail, it is interesting to observe that the above method of gauging the results of certain tasks on the body generally, is useful in grading individuals according to their energy expenditure. During 1930 I conducted experiments on about a hundred individuals—mainly schoolboys—and, with the co-operation of an efficient and experienced teacher, compared the loss of energy in each case with the marks awarded for application in class. The correspondence between the two was striking. My apparatus I called the "neurometer," a simple arrangement of a galvanometer in series with a battery, the subject to be tested, and two potentiometers, with a separate tapping connected with a valve amplifier recording, on an automatic inker, a graph form of the capacitance of the person under test.

The reports which appeared at the time in the public press made much of the results of the neurometer, but, of course, such experiments have been continuing for

many years now. The real fundamental interest of such phenomena lies in the fact that a specific stimulus affects the vaso-motor system so that we get a type of muscular contraction which may, in the case of resistance measurements, arrest the excretion of sweat; thus diminishing the electrical conductivity of the surface tissues of the body. One important feature of this resistance variation is shown in the fact that some people do their best work when their internal temperature



A "neurometer" circuit for gauging the electrical capacity of the surface of a human body.

is above normal. I purposely remarked on this peculiarity at the time, for it is well known that many persons find mental effort much easier at night, others, at such times in the day as seem to conduce to an elevation in their body temperatures. You know how difficult it is to work when the body is cold, indeed, this is quite natural considering that the circulatory system is sluggish and cannot normally feed the brain-cells nor eliminate waste material from the system. The result is a form of auto-intoxication—a blood-poisoning maybe

paralysing the nerves immediately concerned with cerebration.

Now, the French psychologist François, working at the Sorbonne, has discovered a definite relationship between the thought process and the temperature of the body. As the body warms up so the speed of thought is accelerated. His method of increasing the body temperature was to employ the apparatus used so much in modern medicine—a high-frequency generator delivering a current having a "diathermic" or internal heating effect. The results showed that a rise of temperature of  $10^{\circ}\text{C}$ . accelerated the thought process  $2\frac{3}{4}$  times. These are very important facts because they will ultimately lead to greater efficiency in industrial fields of labour. Not that we should propose to "cook up" the workers in a factory so that greater output might result, but we might develop some sort of changed environment through, possibly, an irradiation by high-frequency currents, thus imparting the same "atmosphere" as prevails in a hive of busy bees. At all events, the fact remains that the possibilities of this technique afford wonderful scope in bridging the time-factor—shortening it in other words—and "short-circuiting" the more objectionable features of the daily round. Much work and experiment is, of course, needed before these facts can be put on a commercial footing.

### Changes in Thought Rhythm

Concerning the same subject, but from a different aspect, the discovery of an apparatus for measuring "brain-waves" has recently been recorded. We have become accustomed to hear much about these mysterious and sometimes "hair-raising" disturbances, yet when we do actually learn of them being really measured the majority of us are incredulous. The piece of apparatus used in this particular experiment is a valve amplifier, recording changes in the thought "rhythm," which is regular during normal thought but erratic if any sudden shock disturbs the mind—especially during sleep. Mr. Grey Walters has found it possible with this apparatus to measure the normal and abnormal intensity of thought—another advance in the development of diagnosis of mental disease—and the medical profession is so far interested as to have installed the instrument at the Maudsley Hospital, London, S.E. Much research seems to be indicated in order to co-ordinate the findings of the above records and those other effects which have to deal with mental and physical interaction—all those phenomena which manifest themselves as "psycho-physical reflexes."

Another new development is an arrangement of photo-electric cell and radio-amplifier in conjunction with a tuner resonating to any particular area of the body,

which is capable of "photographing" the area under investigation. This instrument is the invention of Dr. Ruth Brown of Los Angeles who, demonstrating it before experts in the U.S. Patent Office at Washington, declared and showed how it could photograph nerves and other soft tissues (in distinction to X-rays). Here, it would seem, the living cells radiate vibrations which are themselves capable of "photographing" their shape through the intermediary of Dr. Brown's instrument. To my mind this is yet another development of the work of Dr. Gurwitsch, of Russia, who for years has been experimenting with the elusive rays of growing and healthy cells—the well-known mitogenetic radiation—and from a diagnostic point of view the findings of such researches are extremely important.

### Bacterial Wavelengths

Touching on the actual photography of micro-organisms, we all know how very important this branch of identification has now become. Some of the bacteria responsible for food-poisoning apparently radiate certain wave-lengths which exert a specific effect upon the chemicals used in developing the negatives of such colonies. For instance, it has been shown by another American doctor, R. V. Stone, that with a certain reaction (the Stone reaction) a group of pathogenic food bacteria may be carefully studied from the formation of transparent zones around the poisonous organisms, thus distinguishing them from the less virulent germs present. The development of this transparent zone is brought about by allowing the camera-plate to saturate for five minutes in a solution of ammonium sulphate.

I have, perhaps, digressed from our actual subject, but my plea for so doing is based on the fact that wave-length and radiation seem to lie at the root of so many of the vitally important changes of the active organism, that "vibration" is indeed an underlying cause of most phenomena. Further, the measurement of such radiations will, eventually, lead to an exact technique in diagnosing many diseases. Even the micro-organisms of disease appear to radiate some form of vibration—however minute. The human organism in health probably radiates an atmosphere or "aura," the fading of which is due to, and is therefore an indicator of, disease. However fantastic this may seem, there is at least a firm foundation of truth as evidenced in the publicity given to this subject, not only in the popular press but also in literature of a more serious tone.

The application of a recent addition to the apparatus for sound recording, the piezo-electric transmitter, is another advance in the onward march of modern therapeutics. This instrument is a type of radio "analyser" and has apparently been installed in various

physicians' consulting rooms. It locates congestion in different parts of the body, such as the appendix, bladder, etc., and if all the claims made for it can be substantiated, it may well revolutionise diagnosis. We would add, moreover, that all these applications of physical measurement technique to modern medicine must, in the long run, provide a "super-efficient" public health system.

The treatment of disease by colour is by no means a modern system—it was practised many years ago in the U.S.A.—but only recently has it attained any definite medical recognition. It appears that the different colours exercise some specific effect on living matter, for it is common knowledge that the ultra-violet rays have a decidedly destructive action

on many vegetable micro-organisms—bacteria. That is why such rays are valuable in the treatment of certain diseases. But it now appears that many adverse physical conditions—and mental, for that matter—of the body respond to applications of a particular colour. An ideal lamp much used for the above purpose is that known as the Sollux lamp, which consists of a conical or funnel-shaped metal front arranged immediately over a powerful metal filament lamp, generally of a thousand-watt consumption. The front is constructed to hold glass filters of suitable colour, so that the rays may be concentrated on any part of the body under treatment. This is clearly shown in the illustration, where the subject is shown being irradiated with a colour radiation beneficial to his or her complaint.

It is well-established that the red rays stimulate the circulation of the blood—they are useful, therefore, in cases of inflammation, while the blue rays are useful in nervous diseases. Between these two extremes the physiological response is variable, al-

though much good has been effected by the intermediate colours. Yellow and red filters have been satisfactorily used in cases of duodenal ulcer, and gastritis, too, has been successfully treated by red radiation following abdominal irradiation by a Sollux lamp without filters. Cases of deafness have been cured with green light, while the blue filter used after a general body irradiation has proved of great service in cases of high blood-pressure; yellow seems to be indicated in cases of low blood-pressure.

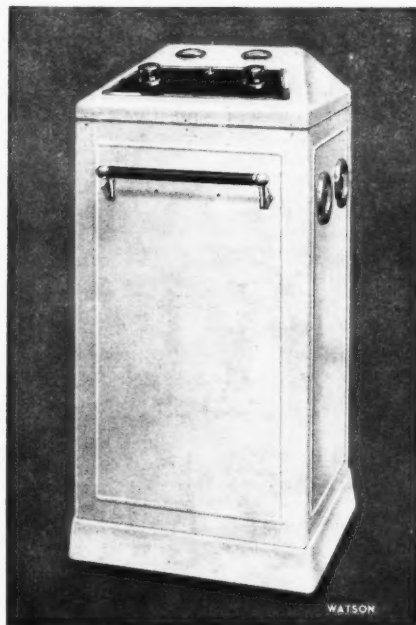
As we approach the red and infra-red there is an increased activity in the growth of bacteria, which is more particularly witnessed in the case of streptococci and staphylococci—one writer specially records this effect and stresses the

importance of excluding the yellow rays in the above cases of infection whether internal or external and also in the case of the coli bacillus. Yellow, he says, causes these micro-organisms to flourish in a remarkable manner.

Not long ago some experiments were carried out by the Institute of Ray Therapy, London, in relation to the question of light stimulus on plants. The results proved that tulip bulbs grew quite normally, producing green leaves and stems and perfectly coloured flowers if irradiated with infra-red rays alone, having been planted in the darkness of a cellar. Thus, it seems that neither the ultra-violet nor the visible wavelengths of the spectrum are absolutely necessary to growth—at least to vegetable growth. The fact that the infra-red stimulates vegetable life has been known for a long time and, therefore, its use would seem to be contradicted in those diseases of a purely bacterial nature, the most valuable frequencies being those of the ultra-violet and violet region.



*The "Sollux" irradiation lamp in action.*



*A "Watson" short-wave therapy unit, operating at a wavelength of 6m. with an output of 300 watts.*

## Excavating a Royal Palace

By Ralph Whitlock

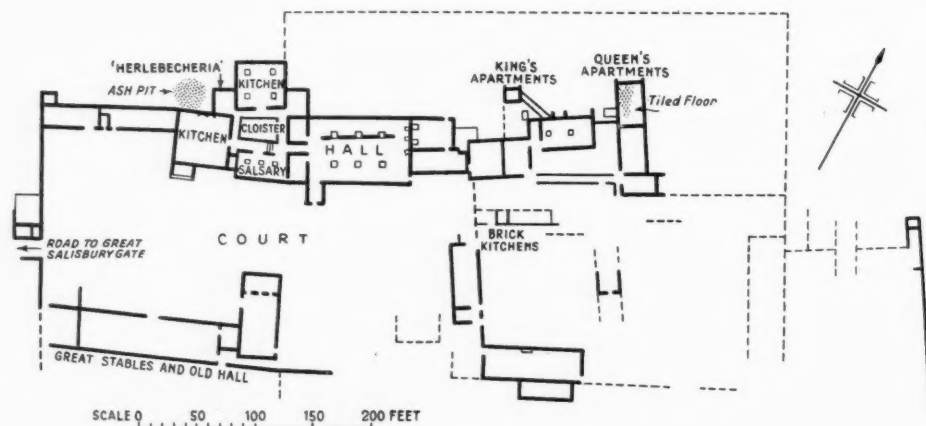
*Of all the buildings famous in English mediæval history, surely none has had a more unhappy fate than the royal palace of Clarendon, in Wiltshire. Little but foundations remains above ground to-day, but recent excavation, this year especially, has led to important discoveries, with the promise of more to come.*

FOR the fifth successive season excavations have been proceeding on the site of Clarendon Palace, near Salisbury, where Dr. Tancred Borenius and Mr. John Charlton are investigating with much success the history of this favourite country seat of mediæval monarchs. Delightfully situated on a wooded hill and within easy reach of the important towns of Wilton and Winchester, Clarendon was for several centuries second to Westminster alone among royal palaces. It was the scene of a number of historical events, including the signing of the Constitutions of Clarendon in 1164. During the Wars of the Roses it fell into disrepair and later into ruin, so that when excavations were begun in 1933 only one wall was visible amid a jungle of dense undergrowth.

Much of the Palace site, which covers seven or eight acres, has now been laid bare. The main group of buildings extends for over 500 feet along the crest of a steep north-western escarpment and comprises several large kitchens, the Great Hall and the suites of the King and Queen, together with numerous antechambers, annexes, and edifices of minor importance. To the south of this series lies the Great Courtyard, which in its turn is bordered on the south by other groups of buildings, most of them either untouched or only par-

Up to 1937 the Great Hall had been completely cleared and the kitchen buildings partially examined. Most of the King's apartments had been thoroughly excavated and interesting discoveries had been made in the room known as the Antioch Chamber—so called because in mediæval times it contained a large mural painting depicting the combat of Richard I and Saladin before the walls of Antioch. This was a two-storied building, the upper room being a chapel. The excavators were able to reconstruct from large quantities of curved tiles found in the Antioch Chamber a section of a rosace floor of striking design, unique in England but very similar to one of the same period to be found in an abbey church in Anjou, which formerly constituted part of the floor of the chapel. In the northern room of the Queen's apartments is another splendid tiled floor in situ. The site abounds in well-made glazed and decorated tiles, and interesting small objects, such as knives, keys, badges, fragments of sculpture and painted wall plaster, coins, pottery, and ornaments are continually coming to light.

Two very interesting features of the Palace are the absence of fortifications, remarkable in an age of massive castles, and the absence of a conventional plan. The building as a whole affords an important link



*Plan of the main buildings of Clarendon Palace, showing the portions explored. Adapted from the plan of the Royal Society of Antiquaries, and including an approximate indication of the excavations made in the summer of 1937.*

tially explored. Along the eastern limits of the site a range of barns, stables and relatively unimportant out-buildings has been found.

between the mediæval stronghold and the Tudor manor-house. Valuable, too, is the insight given into conditions of existence under the Plantagenet kings.



Dr. Borenus and Mr. Charlton enumerate four outstanding results of this season's excavations. The most important is the discovery, in a corner of the kitchen building known as the Salsary, of a well-preserved tile-kiln. Besides being of great interest as the source of the numerous glazed and decorated tiles of Clarendon this kiln has the distinction of being the only surviving mediæval tile-kiln in England outside monastic establishments. It is constructed to bake a minimum of about 2,500 tiles. Second in importance the excavators rank the clearing of the extensive kitchens. This nearly completes the excavation of the main group of buildings.

Of great interest, too, is the opening up of a section of the site hitherto unexplored, namely a series of buildings in a wood on the southern side of the Great Courtyard. Here have been discovered what may well be the "Great Stables" of mediæval records, together with various other buildings of unknown use. In one of the larger secondary apartments an exceptionally well-preserved stone fire-place has been uncovered, and a small annexe to the Great Stables has yielded quantities of highly decorated glazed pottery shards. The excavations in this quarter throw new and valuable light on the economy of the site as a whole.

Lastly, work in the Queen's apartments, towards the north-eastern end of the Palace, has produced many more decorated tiles, some bearing uncommon designs, and fragments of vividly decorated wall-plaster. A very curious and unusual discovery in this quarter has been that of floors of an exceptionally hard cement bearing clear-cut impressions of the undersides of tiles which



[Photo by John Charlton

*Foundations of the Cloisters, showing the steps leading to Great Hall.*

formerly rested upon it; so that it may eventually prove possible to replace many of the tiles.

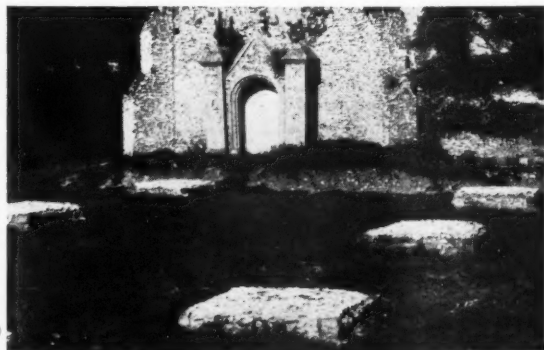
The Queen's apartments have added another new feature to the Palace in the form of a small oratory or private chapel.

This season's excavations have not been delayed by rain to as great an extent as have those of some previous years and, in all, may be considered eminently satisfactory.

## Snow and Ice Study

The idea of forming an Association for the Study of Snow and Ice developed from the desire of the British members of the International Commissions of Snow and of Glaciers respectively, to establish in this country a permanent body to encourage research on the practical and scientific problems of snow and ice, and generally to stimulate interest in the subject. It was brought into being last winter and already numbers over sixty members; and the Association can now be said to be well established. Meetings are held every three months and individual members are engaged on practical work and researches of various kinds.

The present Chairman is Mr. Gerald Seligman (chairman of the British group of the International Commission of Snow) and the Vice-Chairman is Mr. J. M. Wordie (president of the International Commission of Glaciers). Membership of the Association is open to scientists and others who can provide evidence that the study of snow and ice is, or has been, of scientific or practical interest to them. Particulars may be obtained from the Hon. Secretary, Miss P. B. Lapworth, Warren Close, Coombe Hill Road, Kingston Hill, Surrey.



[Photo by L. Munroe

*The Great Hall, with dais and pillar-bases.*

## A Study of Bird Distribution

By Eric Hardy, F.Z.S.

*Mr. Hardy's long-continued observations on British birds are well known, and here he discusses the three birds chosen by the British Trust for Ornithology for survey this year. It is hoped to publish later the findings of the observers when they have been collated.*

AT the suggestion of the British Trust for Ornithology, local naturalists and natural history societies this year have been making a special study of the distribution of three birds: the coot, magpie, and red-backed shrike, the two former being common British birds generally, and the latter very well known in the south. These nationally organised bird studies are becoming an annual event and increasing in value as more field-naturalists take part and thus ensure the comprehensiveness of the facts sent in to Oxford each year. Of last year's subjects, little owl, grey wagtail and lesser redpoll, work is still going forward on the food, etc., of the alien little owl; in 1935 the B.T.O. survey covered the greater spotted woodpecker, pochard and redstart.

Of the three birds chosen for this year's special study of local distribution each has a special interest, for the distribution of the magpie depends largely upon the presence of local gamekeeping interests. It was believed to have been exterminated by gamekeepers in East Anglia, for instance, while it swarms in Merseyside parks and suburbs where gamekeeping is rarely met with. The distribution of the coot depends upon the preservation of fairly large open waters, while the red-backed shrike or butcher bird, a summer migrant and passage bird only, is strangely confined, in any numbers at least, to the southern part of the country.

Although the magpie is generally distributed about our woodlands, there is evidence of migration on the east and south-east coasts, so that special attention is to be paid to its distribution during and outside the nesting season. This long-tailed, black-and-white, chattering member of the crow family is numerous also in Ireland, save the extreme west, and is resident in Scotland, but more local, and occurs only casually in the north and north-west, being a very rare vagrant in Orkney and Shetland and unknown in the Outer Hebrides.

### Magpies in the Suburbs

Magpies are able to tolerate urban conditions where, as in northern England, gamekeeping has ceased with the sale of an estate and new houses have been built all around it. I have in mind a beech wood on Lord Salisbury's Liverpool estate, the subject of many years' nature study by kind permission; since gamekeeping has

ceased, magpies have increased until some thirty birds occupy just over an acre of woodland and, during the winter months, when for courtship display they congregate in the tree-tops, one sometimes disturbs twenty or more from one large beech alone. Yet they seldom travel far beyond a field or two, or down the hedgerows during their feeding, for being slow fliers and conspicuous away from the trees, they are at a disadvantage in the open. Possessing the cunning of the crow tribe, magpies are particularly wily, even where gamekeepers pester them, and in the tree-tops their black-and-white plumage so breaks their outline that they are often unnoticed against the black twigs and white sky.

The gamekeeper—who must do his work or go—rightly accuses the magpie of egg-sucking and the killing of fledglings, but it is not nearly so destructive as the crow. However, a pair of magpies has been known to kill every one of a family of young turkeys, taking them singly day after day, and in quiet country hedgerows near woods we often meet the magpie hunting for blackbirds' eggs. We must admit it destroys a large number of grubs and other insects, worms and sometimes mice. Shy and cunning in the game coverts, the magpie takes well to town life and in the city parks of Liverpool and London becomes tolerably tame. Thriving in woodland bird sanctuaries and town parks, it should be one of the very common birds of the future.

### A Victim of Water-Pollution

The coot, however, may be less numerous in the years to come if the spoliation of our inland waters continues. Requiring larger waters than does the common moorhen, which it much resembles in its black or slate-grey body, though possessing a white beak and forehead, the coot has suffered considerably in many districts from fresh-water pollution (a problem that only the anglers seem to be combating with any success, and they by renting waters) and the turning of many lakes into summertime boating and bathing centres. Feeding on aquatic plants with only so few fish and worms as to have insignificant effect on angling interests, the coot does sometimes become so numerous on East Anglian and other large waters in winter as to justify an organised "coot-shoot." When properly organised the coot-shoot can be a reasonably humane affair, but many coot-shoots

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are a disgrace even to shooting men, for it seems a crowd of young and inexperienced "guns" is invited up and turned loose. Wounded or pricked birds left about the place are numerous, while experienced guns decline to join such parties as much for their own safety as for the birds'.

In severe weather, with their inland waters frozen, coots will visit the tidal waters and offshore, while in winter a few continental birds may visit the south-east, as ringing has shown with moorhens. A common misconception is that the coot, unlike the moorhen, will not come ashore to feed, but it can easily be enticed to do so by leaving corn regularly by its haunts. In summer coot feed very much on the heads of floating persicaria and in winter they dive and bring up large pieces of pondweed that have sunk to the bottom, probably for the winter buds these plants have formed.

### The Butcher Bird

The most interesting of the subjects for this year's survey, though limited in its distribution, is the red-backed shrike, a summer visitor and bird-of-passage and one of the few Passeres, or perching birds, with a hooked beak. Only the adult cock has the red back, his mate's being dull brownish-chestnut and that of the immature bird barred with black. His head and neck are grey and a conspicuous black band crosses his face; there is a buff tint to his breast and his tail is black-and-white towards the edge. From his habit of impaling his prey—beetles, shrews, small birds and bees—upon thorns near the nest in some bush-hedge, or tangled bramble growth, he has earned the rural name of butcher bird. Arriving in early May and departing in late August, this butcher bird is widely distributed in woodland districts of southern and central England and Wales, but is scarce in the north, and much rarer on the west than the east side of the Pennines, visiting annually the Sedbergh district of Yorkshire. In Scotland it is an occasional visitor to the south-east, but nesting records are discredited. It is very rarely seen beyond the Forth, but occurred in Easter Ross in 1919; there are three definite Shetland and four Orkney records, while it is a passage migrant at Fair Isle. There are only three Irish records, in August and September.

Much less inclined to tolerate human habitation than either magpie or coot, the red-backed shrike does, however, occur in Richmond Park, and in 1935 I saw one at 5 a.m. in the birch wood on Thurstaston Heath, a well-known Cheshire camping and rambling centre. Most of the Cheshire records have been near the coast, on passage, but the bird has nested inland at least seven times. I have never seen it in Lancashire, and in the Midlands it is less numerous than it used to be.

## BRITISH ASSOCIATION NEWS

### The Radford Mather Lecture

Mr. G. Radford Mather, to whom the British Association owes the foundation of the Radford Mather lecture, is a retired engineer, now living at Wellingborough. Mr. Mather, who combines wide scientific knowledge with a deep appreciation of the necessity for social service, has many and varied interests. He has given special attention to the study of those forces which govern minimal surface relations, and it was during a correspondence dealing with such matters that the attention of Mr. Mather was directed to the increasing interest shown by the British Association in the repercussions of advances in scientific knowledge on the well-being of the community. Mr. Mather has endowed a triennial lecture, to be given in London or the provinces, to be called the Radford Mather lecture, and to deal, for the most part, with the social implications of the advancement of science. Mr. Ramsay MacDonald gave the first lecture of the foundation last October—practically his last participation in a public function. The scientific world is much indebted to Mr. Radford Mather for this foundation, and it is a matter for regret that, in view of his great age—he celebrated the ninety-sixth anniversary of his birthday on October 17th—he was unable to be present at Mr. MacDonald's address.

### Science Congress President

The late Lord Rutherford had consented to preside over the Jubilee meeting of the Indian Science Congress Association in Calcutta next January, which will be attended by a representative British scientific delegation organised by the British Association. The presidency has now been accepted by Sir James Jeans.

### Berkshire Naturalists

Recent activities of the Reading and District Natural History Society have included a "Fungus Foray" to Burnham Beeches and the 56th Annual General Meeting of the Society. The foray, led by Dr. T. M. Harris, M.A., Professor of Botany at the University of Reading, who was ably assisted by Mr. Gillespie, also of the Department of Botany at the University, and by Dr. Somerville Hastings, was highly successful. Fungi were found in abundance and in great variety, 35 species from 29 genera being noted. The Fly Agaric (*Amanita muscaria*) was in fine condition, as also was the Yellow Gut of countrymen (*Boletus chrysenteron*). The rare *Helvella lacunosa* was observed.

At the Annual General Meeting a tribute of respect and love was paid to the memory of the late John Luther Hawkins, and a resolution was passed, recording the Society's sense of its loss in his decease. Hawkins was one of the founder members of the Society, which he, with a few friends, started in 1881. He was a keen student of nature, especially bird life, and his interesting reports on his observations of bird life were always listened to with great appreciation.



## The New Inventions Exhibition

By S. C. Blacktin, Ph.D., M.Sc.

THE majority will probably agree with one motive of the Institute of Patentees in carrying its Exhibitions of Inventions from London to the Provinces, that "in the past too little encouragement has been offered to inventors." But such a departure, though overdue and welcome, will have to be accompanied by much more positive measures, for instance, a large central fund to subsidise inventors and definite guarantees that their highly-specialised work of national importance shall, without fail, be applied for the advancement of society. Any community which wastes its inventive skill by submitting it exclusively to the eliminative process of industrial interest, is like a farmer who wastes his cream because he gets a good price for his skim-milk.

This year a Coronation Exhibition of Inventions was staged in Sheffield (Oct. 20th to 30th), and Leeds (Nov. 10th to 20th), where some very interesting and novel exhibits have been shown. Roughly, the exhibits may be classified into "gadgets" of considerable potential use, and mechanical advances, the former probably preponderating in the "Domestic and Labour-Saving Devices" section, and the latter in the Mechanical Section. A notable feature is the work of the woman inventor. Though there is a representative showing of clever devices for both specific and general purposes, certain exhibits may be of peculiar interest to readers owing to their application to pressing social, industrial, or scientific problems. These latter, outlined below, were not in the main self-explanatory, but required demonstrators to explain their action to the interested.

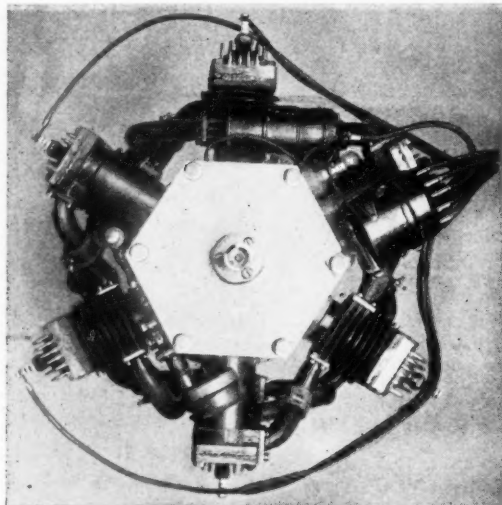
Much interest centred around a balanced two-stroke "six" cylinder engine, and an ingenious if elaborate petrol turbine engine—shown by different inventors. It was understood that the turbine engine yielded a brake h.p. of around 40, the rotor being driven by successive impulses from petrol-air explosions at about 30,000 r.p.m., reduced by gearing to about 2,000 r.p.m., of the driving shaft and automatic induction-com-

pression unit, this unit and the rotor being on the same shaft, with a consequent speed ratio of rotor to shaft forming its bearing of about 15:1. The two-stroke "six"—the novel McClelland engine design—has no valves, tappets or gearing; has all parts correctly balanced; and, ensuring simplicity of manufacture, lends itself to rapid mass production. Since the only reciprocating parts are the pistons and connecting rods which are balanced by an equal piston travelling at equal speed in an opposite direction, vibration and noise are reduced to a minimum. Each crankshaft revolution

has six power impulses, providing even torque equivalent to an ordinary 12-cylinder engine, since the McClelland is a two-stroke "six." Wherever a prime-mover providing high-speed, silent, vibrationless power is required with a short, stiff, "four-cylinder" crankshaft of 12-cylinder torque, this engine is applicable.

An exhibit covering a quite different field, and whose operation and application were actually demonstrated to numerous interested parties, was the Blacktin Electrotor dust and smoke meter. This precision instrument fills an important and growing need in almost all industries and occupations

and has particular reference to Sheffield and the Midlands where the nature of the chief industries is almost inseparable from the production of dusts, often to a dangerous degree. The Electrotor Meter achieves great economy of operation and working parts through the operation of four distinct synchronous principles by the same motive force, viz., rotation, electrification, suction, and centrifuging. Owing to the fact that it has various ingresses for the entry of the sample of particles dispersed in air or gases, together with a revolving particle-deposition disc, a wide choice of deposition areas may be made. This, in turn, means that a suitable deposition area corresponding to the number of particles received may be chosen, and, therefore, that the spatial separation of individual particles being retained, the particles can still be easily counted no matter how dense the sample. Thus a countable range of over 1,500,000 particles per c.c. is covered, whereas in fixed-record instruments whether requiring heavy electric



*The McClelland two-stroke petrol turbine engine. The unfinned cylinders are pumps providing a supercharging effect.*

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batteries, water aspirators, support stands, etc., or not, the range is severely restricted to a maximum order of, say, 25,000 particles per cc., for counting, and in some cases to less than 10,000 per cc. The Electrotor Meter with its ingenious though simple, sturdy, mechanism is about 12 inches long, weighs just over 1 lb., and needs no accessories.

A work-gripping and driving device by W. Bradley is a valuable means of substituting the usual method for gripping certain hollow materials which require to be secured in a lathe or other machines. It is applicable to hollow bodies whose contour, material, or structure the grip of a chuck would damage, but is not restricted to machining operations, *e.g.*, it can be used for winding material on a cardboard tube. This useful advance is achieved by using a frictional grip set up by the application of a *uniform* pressure over a continuous portion of the *internal* surface of the object, through expandible resilient rings secured on to the driving shaft within the object. Effective engagement and release is obtained by means of a suitable lever.

As much attention has been recently focussed on air contamination, it is not surprising that Mr. Yardley's air purifier attracted a great deal of attention. Unfortunately, actual removal of noxious substances was not demonstrated, but the mechanical principle was the motor-driven fan induction of the impure air into a rectangular chamber subdivided into various successive compartments, each possessing in its roof a set of nozzles for removing some impurity by a shower of atomised liquid reagent. The motor synchronously operated special pumps—one to each such compartment—all driven by one shaft, each special pump withdrawing an appropriate solution from a store underneath the compartment to force it through the atomising nozzles over its compartment, the purified air being voided from the last compartment.

Mechanics evinced great interest in Mr. Pelley's universal action box spanner used on a ratchet principle, a most valuable tool for reducing the discomfort of awkward working positions, by the provision of an adjustably movable lever.

An ingenious cycle and pedal support of Mr. Scott enables riders to support themselves in a stationary position without dismounting, whilst a happy device for use with very heavy outer covers too stiff for handling was a simple, and efficient, mallet-shaped lever—an inexpensive boon to all garages.

The total number of new invention exhibits was about 250, of which about 50 were, at Sheffield, classified as from local inventors and catalogued North Midland Section, leaving about 160 as national and international and 40 from local Leeds Inventors.

## A Note on Patent Law

By John Johnston, M.A., LL.B.

THE Statutes of Monopolies—which was passed in 1604—gives the right to “the sole working or making of any manner of new manufactures within the Realm to the true and first inventor and inventors of such manufactures which others at the time of making such patent and grants shall not use.” This Section still forms the basis of the whole of the English Patent law. There is reason to believe that the Patent Office, with the Solicitor-General, and the Law Courts, in order to keep to the word “manufacture” have not granted many patents which are novel and useful. In many cases it has been held that a new use of a known substance does not constitute a new manufacture and is therefore not patentable.

A.F.'s application (31 R.P.C., p. 58) was for the use of a well-known substance as an insecticide, such use being new. Sir Stanley Buckmaster said, “It is an old and a well-established principle that the mere discovery of a new use of a particular known product is not what is meant by invention within the meaning of the Patent Acts.”

In J. Y. Johnson's application (47 R.P.C., p. 178), the Comptroller-General of Patents quoted Mr. Justice Lindley (in *Gadd and Mason v. the Mayor of Manchester*, 9 R.P.C., p. 516), as saying, “A patent for the mere use of a known contrivance, without any additional ingenuity in overcoming fresh difficulties, is bad, and cannot be supported.” In *Test v. Coombes* (41 R.P.C., p. 101), the Master of the Rolls said, “For the purpose of establishing subject matter it is, of course, necessary to show something of manufacture.” In the case of *I.G. Farbenindustrie Aktiengesellschaft* (50 R.P.C., p. 252), Mr. Justice Luxmoore said, “I have no hesitation in holding that this alleged invention does not constitute any new method of manufacture, and, consequently, that the patent should be refused.”

The decisions in the cases here quoted seem inconsistent with the two following decisions. In *Muntz v. Foster* (2 W.P.C., p. 93) the claim was for the use of a particular alloy of copper and zinc for sheathing ships, though such alloy had been used for other purposes. In *Innes v. Short* (15 R.P.C., p. 449), the claim was for the use of powdered zinc in steam boilers to prevent corrosion and incrustation. Both were declared valid.

A new use of a known substance adds to the sum of human knowledge, and brings about a new use of contrivances, and there is reason to believe that it should be patentable—provided, of course, that its use is not obvious to those skilled in the art—whether it be considered a manufacture or not.

## The March of Knowledge

A farmer in South Africa has discovered how to make his own "rain." He has a 180-acre fruit orchard near Cape Town, which is planted on the slope of Table Mountain. From a stream he conducts water through a 2,000-yard long furrow, into a reservoir from which the water is led to a series of other, smaller reservoirs at various levels. Out of these reservoirs he has 6,600 feet of piping of various sizes, passing through the orchard, ranging from a 300 foot level at the highest point. Large whirl sprays, attached to the piping at different points, operate through the pressure of the water. The spray attains a height of 30 feet, and spreads to a distance of 70 feet, so that the spray irrigates a circular area with a diameter of 140 feet. It takes four hours to make one-and-three-quarter inches of rain, but the rainfall can be regulated from a mere drizzle to a deluge by adjusting the sprays. Up to the present the results have been entirely satisfactory.

As an illustration of the important part that asbestos may play in the future in insulating the distracting noises of modern life, the author of a new handbook, published by the Imperial Institute, points out that the material has recently been introduced in several ingenious forms on the Underground Railways of London, and that the new streamlined Coronation trains have both roof and sides covered with acoustic blankets made of asbestos, while the underside of each vehicle is sprayed with asbestos. For sound insulation and acoustical purposes in buildings, a mixture of fine asbestos fibre and an inorganic liquid binding substance is sprayed by pressure on to the parts or walls to be insulated. After drying, the surfaces so sprayed may be covered with other materials such as stucco. The advantage of asbestos over organic materials for this purpose, he adds, lies in the fact that it is vermin-, rot- and fire-proof.

The great searchlight at the Paris Exposition will be the first sign of land to travellers approaching the Old World by air in years to come. It is destined to guard one of the most dangerous parts of the French coast—Creac'h d'Oessant—which is nevertheless much frequented by navigation to-day, as it will be by aviation in the future. This lighthouse, constructed under the direction of the French Service for Lighthouses and Beacons, has attracted much attention. The light proper is 12 metres

high, has a diameter of  $5\frac{1}{2}$  metres, and rests on a base floating in almost a ton of mercury. The lantern has two storeys, each equipped with a system of lenses. In good weather lamps of 3 kW. will be used, but to pierce a fog there will be lamps of 50 kW. (500 amperes x 100 volts) using a continuous current. There are a total of ten lamps, of which either two or four will be used at one time, producing flashes of 0.27 seconds duration and 500 million candle power, every ten seconds.

A fossilised crab (*Xanthopsis nodosa*, Leach), probably more than 50,000,000 years old, has been unearthed during excavation work on the Highgate Tube extension. The fossil was discovered, says the annual report of London Transport, at a depth of approximately 86 ft. in the London clay of the Eocene period—the earliest of the four divisions of the Tertiary era. It is not possible to give anything like an accurate age estimate, it is stated, but calculations suggest that the London clay was deposited some 50,000,000 or 60,000,000 years ago.

The new reconstructed north-west quadrant of the British Museum library is now complete. It is built of steel, instead of cast-iron, with walls and floors of fire-resisting material. Both temperature and atmosphere are scientifically controlled. The alleys between the book presses waste no space, as their predecessors did; and the sliding presses, a device for temporary accommodation of books, made possible by that very waste of space, necessarily disappear. Whereas, before, there were three floors with a single fourth circular gallery running round the outside of the reading room wall, there are now six. Staff accommodation for the whole of the stacks is provided in this first quadrant; the remaining three will therefore give more shelving space in proportion. To facilitate rapid service of books to readers, lifts and conveyors of the "Paternoster" type have been installed, giving connection with each of the six floors at two different points. Fifteen miles of shelving, as against 10 miles in the old, are accommodated in the new quadrant.

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At the meeting of the Quekett Microscopical Club, at 11, Chandos Street, Cavendish Square, London, W.1, on December 7th at 7.30 p.m., Professor L. C. Martin of the Imperial College of Science is lecturing on *The Limitations of the Microscope*. The subject is instructive and interesting to a wide public, and readers of DISCOVERY are cordially invited to attend.

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## Book Reviews

### Homage to a Teacher

*Perspectives in Biochemistry.* Edited by JOSEPH NEEDHAM and DAVID E. GREEN. (Cambridge University Press, 15s.)

Most outstanding scientists can teach if they choose to and many in point of fact actually surround themselves with a school of well trained students performing competently in the Home Field, but the gift of inducing pupils to *think about* their problems as distinct from acquiring information or bringing a given piece of research to a publishable conclusion is rare. Perhaps this is all for the best, for once you have started the rank and file on the dangerous enterprise of thinking you can control neither the subject nor the direction of their thoughts. Throughout his long career as the centre of a school, Sir Frederick Gowland Hopkins has—heedless of consequences—infected all who remain long in his vicinity with something of his own unconventional method of approach to biochemical problems. The editors of this volume have presented him with some of the consequences of his rashness; we wish we could read his own review of a book of which he is the author in the second degree.

The thirty-one contributors to this volume were, according to the excerpt printed on the dust-cover, actually invited to be speculative; this invitation must, we suppose, confer on their speculations the protection afforded by the phrase "without prejudice." At any rate, some of the contributors have allowed themselves to transcend slightly their customary barriers of caution and reserve.

It is impossible for a reviewer to deal adequately with thirty-one essays on as many different aspects of biochemistry; he can only record personal impressions realising that these will vary with the individual reader.

One of the most fascinating articles, frankly informative rather than speculative, is that of V. B. Wigglesworth on the hormonal regulation of insect growth. This deals largely with the author's own work on the development of bloodsucking bugs and shows how the successive stages of nymphal growth with intermediate moulting and the final emergence of the adult form depend on a hormone situated in the *corpus allatum*; the author shows *inter alia* how by manipulating this gland the number of nymphal stages may be increased or the onset of adult structure prematurely evoked.

Another delightful informative essay is that of D. J. Bell who traces the progress of carbohydrate chemistry

from the days of Emil Fischer, showing how this occurs in rhythmic alternation of a technical advance and its exhaustive exploitation followed by a pause, then a new technical advance, and so on.

Particularly valuable to the general reader are Sir Edward Mellanby's views on toxamins in diet and L. J. Harris's article on the value of vitamin C in combating infections. J. H. Quastel's article on the application of biochemistry in the treatment of mental disorder will open the eyes of many to unsuspected possibilities in this direction.

Those who like biochemistry flavoured with psychology will enjoy essays 11, 14, 15, 16 and 18. Here five prominent workers dealing substantially with the same material—recent advances in oxidations and fermentation—produce five quite different pictures delightfully supplementing each other. It is as if the same scene had been painted by Constable, Corot, Turner, Cézanne, and Van Gogh.

Work on the boundary lines between the sciences is apt to illuminate regions where our ignorance is blackest (though liable at the same time to attract the most vigorous criticism from the less adventurous occupants of the centres of the respective zones). Such studies find an appropriate setting in a work of this kind. Thus the impact of mathematics on the study of the protein molecule is discussed by D. Jordan Lloyd; the behaviour of large molecules in surface films by N. K. Adam, and the biochemical behaviour of viruses by B. Holmes and A. Pirie.

The speculations of J. D. Bernal on the structure of striped muscle fibre appear as an exquisite piece of inductive reasoning; the editors must feel proud that this new theory, by which the molecular form of the fibril is regarded as a rope-like structure with an alternating right and left hand twist, first sees light in this volume.

Since confidences are the order of the day, the reviewer may add that the essay from which he derived most enjoyment was No. 2 in which N. W. Pirie patiently undermines the position of those biologists who delight in arguing about whether this or that biological unit—be it enzyme or virus, muscle preparation or bacterial suspension—is "alive" or "dead." In future the posers of this question will be asked to define their terms and if they are wise they will decline to do so.

One of the secondary pleasures afforded by this volume is the evident delight with which the contributors fulfilled their task; enjoyment of their subject is perhaps another gift which they owe the teacher to whom this entertaining volume is presented.

## Language and Sense.

*The Tongues of Men.* By J. R. FIRTH. (Watts, 2s. 6d.)

This is a lively and stimulating book on one of the greatest of the most strictly human topics. The author would probably say the greatest of all, and it would be difficult to contradict him, seeing that the very word for language is the same as reason in the language of the most gifted people who ever lived, and that the Scriptures tell us that, "In the beginning was the Word and the Word was with God and the Word was God."

Mr. Firth raises, more or less summarily, all the great questions which fall to be treated in the science of linguistics. No one would probably be readier than he to admit the necessary inadequacy of a treatment of them all in 157 short pages. Yet one cannot but think that he might have made his treatment more effective within these narrow limits by a stricter relevance, an abstention from a good deal of loose talk and repetition, and by a more detailed examination of one or two of the points raised. It does not, for instance, seem to advance the cause of linguistics to say that, "More plumbing and less poetry is the motto for modern education." There is a good deal of that kind of talk in the book with repeated and rather pointless jibes at the Oxford accent. Whatever this may be, it has, according to the author's own canons, as much right to survive as the talk of Jarrow or Crewe.

But we should, no doubt, take all this as the effervescence of the modern spirit in a world which, as we are repeatedly told, is being rapidly and completely changed. And it is certainly true and should be emphasised, that on all the main topics on which the student of language has to pronounce, Mr. Firth comes down clearly on the right side. He shows, for instance, that speech is the expression of the whole man and not merely the articulation of certain sounds by the vocal organs. He disposes in this way—as of course has been often done before—of theories of language which would limit it, either to one original form of speech or to the imitation of certain external sounds or to mere interjections prompted by feeling. The man's whole being has contributed and has found its chief outlet in the sense of hearing, which is evolutionarily the latest of our senses to develop. It is thus that poetry and still more music became the most purely human of all the arts. The different main types of language are also clearly described and illustrated—the isolating or positional; the agglutinative; the flexional—while no single language is now, or probably ever was, exclusively of one type.

With regard to the future, the author says more than once that English is the "only practicable world language," though, by regretting that Esperanto was not invented before Volapük, he seems to imply that had it been so, it might have filled the place of the universal auxiliary language. This is a good example of the need of more thorough examination of one or two questions in the book. We get, for instance, no hint either of the difficulties in the way of universal English, or of the real and fundamental objections to any artificially constructed form of speech. We are told—as is perfectly clear and important—that "empire has made the world-languages of the past," Latin and English. French might have been added in virtue of its empire of rather a different kind. The intellectual disadvantage to any people of its language becoming universal is not mentioned, nor the intellectual gain of having to translate one's native form of speech into at least one other.

F. S. MARVIN.

## Light on the Bantu Problem.

*The Bantu-Speaking Tribes of South Africa: an Ethnographical Survey.* Edited by I. SHAPER. (Routledge, 21s.)

The expression of feeling evoked by General Hertzog's demand on his return to South Africa from the Imperial Conference in London for immediate action in the matter of the promised transfer of the South African Native Protectorates, Bechuanaland, Basutoland, and Swaziland, to the Union of South Africa, was sufficient indication that if South Africa under the Statute of Westminster is now entirely responsible for her native population, the British public is nevertheless not indifferent as to the methods adopted in handling the native problem. At the same time it must be remembered that criticism, unless informed, is not merely valueless, but may be positively harmful.

Hence this survey of the Bantu-speaking peoples of South Africa, which has been edited by Professor Shaper for the Inter-University Committee for African Studies of the Universities of South Africa, makes a welcome appearance in an English edition. It gives in a readily accessible and assimilable form an account of the culture of these peoples, as they were before they had undergone material modification by contact with European culture. Without being overloaded with detail, it is sufficiently inclusive to convey a conception of the essential features of native civilisation. Each of the chapters, which, as a whole, cover the more important aspects of native mode of life, social organisation, and religious belief, has been written by a recognised expert from first hand knowledge. Professor Raymond Dart, for example, writes on racial origins, Dr. A. J. H. Godwin on habitat, Mrs. Hoernle on social organisation, and magic and medicine, and so forth. The value of the book, however, from the point of view mentioned above depends not so much on the account of the Bantu-speaking peoples as they once were, as on those chapters which deal with them as they are now. For this purpose Professor Shaper on cultural changes in tribal life and Miss Monica Hunter on the Bantu on European-owned farms, as well as Miss Hellmann on the native in the towns, are especially to be commended.

E. N. FALLAIZE.

## Rhododendron Land.

*Plant Hunter's Paradise.* By F. KINGDON WARD. (Cape, 12s. 6d.)

Here is a volume that will give pleasure to many kinds of readers. It is intended, no doubt, primarily, for the scientific botanist, the horticulturist, and the gardener (professional or amateur); but all those who care anything for a well-told tale of travel in the unknown quarters of the globe, or have any interest in unfamiliar fauna and flora, will derive much pleasure from it.

Mr. Kingdon Ward's reputation among botanists as a traveller and plant-collector is fully established; were it not, the present volume would make it so. The general reader will here enjoy a very human document, written apparently quite casually from notes made on the spot—an occasional repetition establishes the casualness. The author clearly loves the plants he is collecting and his vivid descriptions of the splendid flowers and trees of the valleys of N. Burma and S.E. Tibet make the reader long to go and see for himself—until he is pulled up sharply by a reminder of the ticks, stinging flies, fever and damp, that have combined with the difficult configuration of the land to make this area one of the most thinly-peopled fertile regions of the world.

Though primarily concerned with the vegetation, Mr. Ward's observant eye records much else for our entertainment: the

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## The Mountain

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oppression of the dying Daru tribe by the more vigorous Tibetans; the lack of effective government in this outpost of the Indian Empire; the vagaries of Ba Kai, who may have been a very plain cook (no wonder, as he had to cook in a recumbent position as often as not), but who was ultimately responsible for the presence of the lovely *Gentiana gilvostrata* in English gardens. The author's relations with his fellow-traveller, Lord Cranbrook, seem to have been of the very best; judicious arrangements for a little privacy, when possible, are certainly to be commended on such expeditions. The consequent real co-operation between the explorers had the happiest results for the expedition and for science. Perhaps Lord Cranbrook may be encouraged to write on his experiences in collecting the fauna of the district.

Rhododendrons, of course, are the key-note of the floral harmony of these Himalayan slopes; and their many varieties are clearly and enthusiastically described. None of them, however, excited so breathless an admiration as the Carmine Cherry, whose first spring flowering was greeted by the explorers with the brief but expressive word "Golly!" Several interesting points are brought out *en passant*: the remarkable adaptation of the seed arrangements of rhododendrons, varying with the ecological conditions; the different foliage plan of the immature and mature plants; and the preponderance of male plants among the local bisexual genus of arum-like cuckoo-pint (*Arisæma*). The rhythm of the high alpine flora is controlled by the melting of the snows; the plants on the north side of a small gully will be quite different from those on the south side. Bracken, in Burma as in Britain, threatens to become a menace on the man-made clearings on the mountain-side. Isolated trees left standing in the jungle roads tend to die for some not very certain reason. All these points are keenly taken and show the young scientist the field for further enquiry.

Misprints are few and not very important, and excellent brief appendices (weather conditions, fauna and flora) summarise the results of the expedition. The two simple maps are perfectly adequate for their purpose, and the beautiful photographs are well selected and finely reproduced.

JOHN LAMB.

### A Camera in High Places

*The Mountain Scene.* By F. S. SMYTHE. (Black, 12s. 6d.)

Although the author has truly earned a reputation as a great mountaineer this book is intended not so much for his fellow experts as for the wide field of those who "enjoy the hills," and 78 photographs reproduced in it have been chosen to illustrate points in mountain photography not for enthusiasts armed with ultra-expensive equipment but, for those who like to bring back some simple pictorial record of their wanderings in the hills. In his preface, the author confesses that he has read nothing about the finer points of photography and insists that he is only an amateur of the art, but the majority of these photographs reproduced show that experience or natural skill have enabled him to make really beautiful pictures of high places whether in Surrey, the Alps or the Himalayas. Each is accompanied by a short note which, in most cases, combines a discussion of the photographic difficulties involved with a record of some incident in the story of an expedition. The result is a combination of much sound advice most pleasantly administered and a collection of photographs which should delight even those who never handle a camera.

### Dragonflies and Dragon-Flies

*The Dragonflies of the British Isles.* By CYNTHIA LONGFIELD (Warne, 7s. 6d.)

As 36 years have gone by since the appearances of Lucas's work on British Dragonflies there is obviously scope for a clear and popular account of these extraordinary insects. Miss Longfield has filled the gap well, and her key and detailed figures of the wings and bodies will be of great help to beginners in naming their captures, just as her hints of times of appearance and methods of technique will be very useful to experienced collectors. The photographs are good, and give the expression of the creatures, so to speak, but no photograph of museum specimens can give more than a general appearance of the living insect, for the brilliance and lustre are inevitably lost.

The nomenclature is modernised, but I cannot express any sympathy with the invention of "popular" English names. In fact, I consider this a mistaken policy. When I was but ten years of age, and knew the commoner British butterflies by their English names, an elderly entomologist advised me to learn their Latin names, and to use them. That was sound advice which I have never regretted. If semi-literate gardeners can freely use such names as *Antirrhinum* and *Delphinium*, why should anybody boggle at names that are no worse, and have the advantage of being correct and international? Why trouble to coin "Orange-spotted Emerald" for *Oxygastra curtisii* which is so rare that it is "scarcely likely to be seen by the average person"? Nor can I see that "Blacklined Orthetrum" has any advantage over *Orthetrum cancellatum*.

Miss Longfield writes that a somewhat unfortunate situation has arisen by the double use of the word "dragonfly," as for the past fifty years it has been used as the popular name for the whole order. Was it really worth the effort to restore the archaic use of the word, but spelt with a hyphen, "dragon-fly," only for the *Anisoptera*, and either to revive another archaism or anglicise a French term, and produce "damsellies" for the *Zygoptera*? Probably all entomologists alive to-day have used "dragonfly" for the whole order of the Odonata and got on very well with it. To use the two spellings, each with a different meaning, in the same book leads rather to confusion than to simplification. In the same way, I cannot see any advantage in coining the names "hawker" for the larger species, and "darter" for the *Libellulidae*. "*Aeshna*" is probably a consistent oversight.

Since writing the above, I have learnt that the Americans commonly call the *Zygoptera* "damselflies," without a hyphen, and use "dragon flies," also without hyphen, for the *Anisoptera*. They are referred to in popular American books on natural history also as "darners," clearly from the old name "devil's darning needles." As this is an existing recognised name, there is no need for Miss Longfield's "darter."

Such criticisms as I have made are, perhaps, captious and personal. The book clearly fills a need, and should do much to draw attention to insects which can fly at sixty miles an hour and, although affording a basis for the design of the aeroplane, yet do what no aeroplane can do, and that is "go into the reverse." Catching such powerful fliers over a pond and working out the life-histories of the queer nymphs with their extraordinary masks, combine all the elements of a popular and sporting occupation.

MALCOLM BURR.

### Scientific Journalism

*Frontiers of Science.* By C. T. CHASE. (English Universities Press, 12s. 6d.)

*The Advancing Front of Science.* By G. W. GRAY. (McGraw-Hill, 12s. 6d.)

*Man in a Chemical World.* By A. C. MORRISON. (Scribners, 12s. 6d.)

It is probably significant that these three volumes, each treating of a wide field of modern knowledge in a popular and general way, have all an American origin. They are roughly uniform in size, ranging from just under 300 to just over 350 pages of large octavo size, and they are all very fair examples of the soundest modern tendency in scientific journalism—which must be sharply differentiated from journalistic science, a very much baser method of covering paper with print.

The late Professor J. Arthur Thomson set a standard of scientific journalism which is seldom attained, and it may at once be said that none of the books here under review attains it, but they are far from being valueless on that account. Dr. Chase, as the title of his work implies, deals mainly with the recent discoveries made by telescope and microscope towards the two extremes of possible human perception; and he ends up significantly in that region of semi-living cells to which the modern biochemist is devoting such keen attention to-day. The illustrations are few, but judiciously chosen, and the Astronomer Royal contributes a sympathetic foreword.

Mr. Gray's book covers partly the same ground, but is more purely journalistic; as the author says in his Preface, his aim has been "to report news." His method has been to invite the co-operation of scientific workers in the United States, and it can be said without hesitation that the arrangement has proved a most happy one. The author succeeds rather remarkably in writing of scientific achievement in a pleasant and friendly style without degenerating into the childish or facetious. He illustrates his work, not with pictures, but with pertinent anecdotes.

*Man in a Chemical World* is the most exclusively American of the three volumes here reviewed. But though it is admittedly propaganda for the chemical industries of the United States, it nevertheless applies also to other countries where a "high standard of living" is attributable to advances in chemical science, and indicates clearly the steps by which human ingenuity has succeeded in overcoming lack of uniformity. The allegorical illustrations and statistical tables will undoubtedly have a strong appeal for a certain type of wondering mind.

### A Neglected Explorer

*African Odyssey.* By W. ROBERT FORAN. (Hutchinson, 18s.)

Those who expect to find thrills in this book will meet with disappointment. Yet, if blessed with true understanding, they will be content to admire the cool courage, constant tact, determination and modesty of Verney Lovett-Cameron, the young naval officer who blazed a historic trail across Africa in the 'seventies. When Cameron left Bagamoyo early in 1873 to meet Livingstone, nothing was known regarding the area of the various river basins or of the watersheds between them. Even to his death, Livingstone contended that the Lualaba was the Nile and not the Congo. Samuel Baker also was firmly convinced that Lakes Tanganyika and Albert were the same sheet of water. During his journey Cameron solved the problem of Lake Tanganyika's outlet; explored and surveyed the lake's southern

extremity; proved that the Lualaba was the headwater of the Congo; and, by tracing the watersheds of the Nile, Zambezi and Congo rivers, was able to define the limits and areas of the principal hydrographic basins of Central Africa. Cameron completed these heroic tasks under terrible conditions, which would have broken the spirit of any man less hardy, resourceful and courageous.

The final and most hazardous stage of the crossing through unknown territory was completed without the companionship of his own kind, his native followers often proving untrustworthy and causing the explorer acute anxiety. After being considered lost or dead in the wilds of Africa, Cameron won through to Benguela in Angola, on November 7th, 1875.

The author points out that the name of Verney Lovett-Cameron is too often overlooked and rarely accorded its rightful place among other 19th-century African explorers. The fact that memories are notoriously short, coupled with Cameron's own modesty, can be held responsible for this neglect. Having had an intimate acquaintance with the greater part of the African hinterland since the beginning of the present century, Major Foran appreciates the heroic qualities of Cameron's expedition, and accords them the dignified and sympathetic treatment they deserve. His book should certainly go a long way towards putting the name of Verney Lovett-Cameron in its rightful place, high in the list of men who blazed a trail through the heart of "Darkest Africa," although, as the author points out, through the untiring efforts of men such as Cameron, there is now no justification for the use of the term.

*A Short History of Chemistry.* By J. R. PARTINGTON. (Macmillan, 7s. 6d.)

This book has two distinct features which, considered alone, will make it a useful addition to any collection of books upon chemistry. First, each of the sixteen chapters is provided with a lengthy summary and supplement, in which the dates of outstanding discoveries by individual investigators are given; secondly, there is a valuable series of about 100 portraits. Professor Partington, moreover, from his previously published work, is well known to be particularly gifted for the task of compressing a vast number of facts into a relatively small space without omitting anything of importance or with any chance for the reading to become monotonous. In the present book it has been his aim to give a concise survey of the history of chemistry beginning at the days of man's earliest knowledge of metals and finishing with modern investigations of the radio-active elements. The period prior to the time of Robert Boyle has been treated briefly, but Van Helmont has been given more space than might have been expected because he definitely represents the transition point from alchemy to chemistry. In later chapters considerable space has been devoted to the development of physical chemistry, of which no special history has hitherto been published.

*Noise.* By A. H. DAVIS, D.Sc. (Watts, 2s. 6d.)

Readers of this journal will be familiar with the general features of the problem of noise (see DISCOVERY, December, 1934, p. 345) and have no doubt followed the efforts of the authorities in getting some of the needless noises suppressed or controlled. The present book enlarges on the practical side of the nature of noise generation, transmission, and suppression, and needs no further recommendation than the knowledge that

the author is easy style of whole, and important from

*Relativity and* 3s. 6d.)

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*French Pain* (Batsfor

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the author is in the forefront of scientific noise studies, has an easy style of exposition and a balanced view of the subject as a whole, and seems to have omitted nothing which might be important from the reader's point of view.

*Relativity and Robinson.* By C. W. W. (Technical Press, 3s. 6d.)

Sub-titled "a treatise for very simple people," this compendious and excellently produced small volume should be in the library of all who have the slightest interest in the problem of the construction and working of the universe. The "very simple people," that is to say, the enormous majority, should be heartily thankful to C.W.W. for making the first really successful attempt to explain, without formulae and in straightforward language, the major problems of relativity, gravitation, four-dimensional space, and the like, which in the "official" books are drowned in a sea of symbols. Mathematicians themselves should not scorn it, as it enables them to provide the answers to importunate enquiries, which few of them, to be frank, could do without its aid. The author has a keen appreciation of the value of a lucid diagram, and the 47 figures are admirably chosen. Proper reverence for the importance of the subject has not precluded an appreciation of its humours. "Robinson," the seeker after knowledge, is really a pretty shrewd fellow; and the simple people for whom the book is intended will not do badly if the questions they ask are always as pertinent as his. In brief, this is an ideal Christmas gift for anyone with an enquiring mind.

*French Painting and the Nineteenth Century.* By JAMES LAVER. (Batsford, 21s.)

The 19th century was for France a "Grand Siècle" in more senses than one; and a study of its amazing output of great painting, in relation to the many stirring events of the time, is bound to be highly interesting. Mr. Laver's work is certainly that; and the beauty of its production, its numerous illustrations—nearly all of works in private collections—and its excellent printing, heighten one's pleasure in handling it. Mr. Sevier's biographical notes are of great value.

Yet it is a disappointing book in some ways. The influences of the Revolution, of the First Empire and the long wars that succeeded it, on art and on life in general, are mentioned; also that of science in the last third of the century. Beyond this, little is said of the varied and interesting milieu in which all these works were produced. Corot—one of France's greatest and most versatile painters—has little mention; Monticelli, Fantin-Latour and Puvis de Chavannes, have none—except for Mr. Sevier's brief notes; Ricard and Besnard, none whatever. The outstanding figures among the (so-called) impressionists receive somewhat better treatment—notably the great Manet. But Mr. Laver surely errs in saying that they were not concerned with draughtsmanship as the natural basis of painting. They proceeded somewhat thus: they sketched in the subject, slightly, but quite accurately, in charcoal, paying much more regard to tone (or "values") than to contour; then, with the brush, and, as it were, working from the *inside* of the figure, etc.—and with great attention to the varying planes—they built up their picture structurally (we should say nowadays, "architecturally"). Much of this drawing in paint was effected by brush-work, which varied to emphasize the difference between textures. Of this brush-work, Manet's paintings are the classical exemplars.

"Pointillisme," first thought of by Claude Monet, but carried out systematically by Seurat, Signac, and a few others, consisted in covering the canvas with round dots of the 3 hues called by

painters "primary," red, yellow, and blue, from which—instead of from the three true "fundamentals," red, green, and violet-blue—it is easiest for them to produce, by mixture, other hues, owing to the peculiar nature of pigment. They were juxtaposed on the canvas in different quantities as required. Claude Monet was too great an artist to subject himself to such discipline but he did practise "Divisionism"—i.e., he laid strokes of pure colour side by side, instead of first mixing them on his palette. So did Seurat, in his middle period; in his early paintings, such as our own "Baignade" (Tate Gallery), he mixed his colours for the illuminated parts of the flesh, etc., and laid them on in broad brush-sweeps.

I do not think a "Divisionist" with any scientific knowledge could have thought he could produce "an astonishing increase of brilliance" by juxtaposing blue and yellow, though certain blue and yellow pigments form, by subtraction, dullish greens when mixed.

The postscript, by the lately-deceased Alfred Flechtheim, is a valuable guide to appreciations (in the form both of exhibitions and of literature) of French 19th-century art, but it is odd that the works of Mauclair, one of the most penetrating critics of that period should be omitted. Much praise is bestowed on Meier-Graefe, but his book, though showing his nation's conscientious thoroughness, shows also its characteristic lack of sensibility the works of Mauclair, one of the most penetrating critics of that period, should be omitted. Much praise is bestowed on Meier-Graefe, but his book, though showing his nation's conscientious thoroughness, shows also its characteristic lack of sensibility regarding the plastic arts. To this lack, "l'Art Nouveau" was a deplorable monument. The statement that the names (!) of French painters and titles of their works were exclusively rendered in Irish at the exhibition of Sir Hugh Lane's pictures in Dublin is (unfortunately for the gaiety of nations) not the case.

MARY BARNE.

### Short Notices

*A Text Book of the Differential Calculus* (S. MITRA and G. K. DUTTA. Hefter, 10s.) is designed to fill the need felt by teachers in India of a suitable book in the English language on the Infinitesimal Calculus. The book opens with a clear discussion on the ideas of variables, bounds and limits, and should present no difficulty to readers with an elementary knowledge of algebra and trigonometry. It is clearly printed and stoutly bound.

*An Introduction to Modern Thermodynamical Principles* (A. R. UBBELOHDE. Oxford University Press, 8s. 6d.) provides an introduction to the principles forming the basis of the use and evaluation of thermodynamic functions, and also enters into discussion of several special topics, such as magnetic methods of obtaining low temperatures.

*Everyday Life in Roman Britain* (MARJORIE and C. H. B. QUENNELL. Batsford, 5s.) is an improvement and an enlargement of the first edition published thirteen years ago. The authors' method of awakening historical imagination is justly famous by now, and this volume enhances their reputation. Due attention has been paid to recent discoveries in Roman Britain, both in the text and in the illustrations and the photographs of Roman remains as they exist to-day are splendid. One slight criticism for future editions: the lettering on the map of Roman roads and stations is not as distinct as it might be; and more names could safely be included.



*The Design and Construction of Flying Model Aircraft* (D. A. RUSSELL. (Harborough Publishing Co., no price stated) deals with the aerodynamics of medium and large-sized flying models, both power and rubber driven, and illustrates practical points with diagrams and photographs. A chapter on wind-tunnel testing is particularly interesting.

*The Microscope* (J. R. UPTON. Murray, no price stated) is written by the Senior Biology Master of a Nottingham secondary school, and aims at providing the information necessary to use a microscope in a biological laboratory. The author believes that few students or teachers use it really well, and from his extensive experience he has produced a book which should certainly help to remedy this. There are several line illustrations.

*Weather Rambles* (W. J. HUMPHREYS. Baillière, Tindall & Cox, 11s. 6d.) is a somewhat uncontrolled ramble through the realm of meteorology, dealing here with Aristotle and there with a Prairie Twister. The illustrations are of the first class.

*Amateur Power-Working Tools* (A. F. COLLINS. Lippincott, 7s. 6d.) is a closely-written catalogue of the smaller machine tools by an American author, with a short historical note. The text, fully annotated and well illustrated, gives many useful hints as well as practical directions. This is a useful and compendious bench-companion.

The second edition of *Earth-Lore: Geology without Jargon* (PROFESSOR S. J. SHAND. Murby, 3s. 6d.) has new subject matter in the form of a chapter on "Atlantis and other Lost Continents." Although certain regions—once dry land and even inhabited by man—may have sunk beneath the sea, the author points out that the existence of an Atlantic continent and "the lost continent of Mu" in the Central Pacific are incredible on geological grounds. Evidence to disprove the legends is given in a style which is in keeping with the rest of the book, where a sound knowledge of the significance of geology is presented in good non-scientific English. There are fifteen additional illustrations.

That chemistry plays an important part in the daily lives of the people is the central idea of *Modern-Life Chemistry* (F. O. KRUEH, R. H. CARLETON and F. F. CARPENTER. Lippincott, 8s. 6d.). The joint authors are high-school teachers, and they accept the philosophy that "high-school" chemistry should so function that it modifies individual and social aspects of human behaviour in a desirable way; in their own words, "it should not be taught merely for the sake of chemistry, but for the sake of the learner." With 360 illustrations, covering all aspects of the application of chemistry in a modern world, this book should easily stimulate an inquiring mind on the part of the student.

*The Newer Alchemy* (LORD RUTHERFORD, O.M., F.R.S. Cambridge Univ. Press, 3s. 6d.) gives a brief account of modern work on the transmutation of the elements. The subject is treated with clarity and precision, and the book, which is very well illustrated, is one which will be of great interest to the general reader.

*Molecular Beams* (RONALD FRASER. Methuen, 2s. 6d.) is another addition to Methuen's admirable series of Monographs on Physical Subjects. The author selects certain sections of the subject and deals with these in some detail. The main topics

include molecular beams, gas kinetics, magnetic and electric moments. This excellent book will be of great assistance to all serious students of physics.

*A Scheme of Inorganic Qualitative Analysis* (E. M. STODDART. Heinemann, 1s. 6d.), gives an outline of the procedure generally adopted for the chemical analysis of inorganic substances and simple mixtures. All inessential details are omitted in order that the book may be used at the laboratory bench.

### Books Received

- Mapungubwe.* By LEO FOUCHE. (Cambridge University Press, 50s.)  
*Ancient Cyprus.* By STANLEY CASSON. (Methuen, 7s. 6d.)  
*Knight in Africa.* By C. W. R. KNIGHT. (Country Life, 10s. 6d.)  
*The Land that Time Forgot.* By M. J. LEAHY and M. CRAIN. (Hurst & Blackett, 12s. 6d.)  
*The Heart of a Continent.* By Sir FRANCIS YOUNGHUSBAND. (Murray, 9s.)  
*Baghdad Sketches.* By FREYA STARK. (Murray, 12s. 6d.)  
*Animals for Show and Pleasure in Ancient Rome.* By G. JENNISON. (Manchester University Press, 12s. 6d.)  
*More Songs of Wild Birds.* By E. M. NICHOLSON and M. KOCH. With three gramophone records. (Witherby, 21s.)  
*Studies of British Birds.* By "FISH-HAWK." (Duckworth, 15s.)  
*Fish who Answer the Telephone.* By Y. FROLOV. (Kegan Paul, 6s.)  
*Tropical Aquariums, Plants and Fishes.* By A. L. WELLS. (Warne, 3s. 6d.)  
*An Introduction to Economic Botany.* By J. GILLESPIE. (Gollancz, 1s. 6d.)  
*Applied Mycology and Bacteriology.* By L. D. GALLOWAY and R. BURGESS. (Leonard Hill, 10s.)  
*Weeds, Weeds, Weeds.* By Sir CHARLES BOYS. (Wightman, 1s.)  
*The Mystery of Scent.* By H. B. C. POLLARD. (Eyre & Spottiswoode, 10s. 6d.)  
*The Chromosomes.* By M. J. D. WHITE. (Methuen, 3s. 6d.)  
*Atomic Artillery.* By J. K. ROBERTSON. (Macmillan, 10s. 6d.)  
*The Observational Approach to Cosmology.* By EDWIN HUBBLE. (Oxford Univ. Press, 6s.)  
*Very Low Temperatures.* By T. C. CRAWHALL and O. KANTOROWICZ. (H.M. Stationery Office, Vol. 2, 2s.; Vol. 3, 1s. 3d.)  
*Modern Rubber Chemistry.* By H. BARRON. (Hutchinson, 18s.)  
*Our Wandering Continents.* By A. L. DU TOIT. (Oliver & Boyd, 18s.)  
*The Battery Book.* By H. H. U. CROSS. (Technical Press, 5s.)  
*The Making of a Scientist.* By R. L. DITMARS (Macmillan, 14s.)  
*What Science Really Means.* By J. W. FRIEND and J. FEIBLEMAN. (Allen & Unwin, 7s. 6d.)  
*Philosophy and the Physicists.* By L. SUSAN STEBBING. (Methuen, 7s. 6d.)  
*Sex, Custom, and Psychopathology.* By B. J. F. LAUSCHER. (Routledge, 21s.)  
*Civilization and Disease.* By C. P. DONNISON. (Baillière, Tindall & Cox, 10s. 6d.)  
*Nationalism and the Communal Mind.* By E. HANBURY HANKIN. (Watts, 7s. 6d.)  
*Life as a Whole.* By J. W. BEWS. (Longmans, 15s.)  
*Mea Culpa, and the Life and Work of Semmelweis.* By I. F. CÉLINE. (Allen & Unwin, 5s.)  
*Georges Dreyer: a Memoir.* By MARGRETE DREYER. (Blackwell, 10s. 6d.)  
*Majority Rule.* By B. WHITELEY. (Published by the author, 2s. 6d.)  
*The Nature and Meaning of Evil and Suffering as seen from the Evolutionary Standpoint.* By C. J. BOND. (Lewis, 1s.)  
*Scottish Industry To-day.* By C. A. OAKLEY. (Moray Press, 7s. 6d.)  
*France.* By E. E. EVANS. (Christophers, 4s. 6d.)  
*Taha the Egyptian.* By M. CATHCART BORER. (Pitman, 3s. 6d.)  
*The Disappointed Lion.* By A. N. TUCKER. (Country Life, 7s. 6d.)



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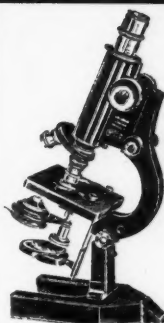
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